Parks Canada-Technical Reports in Ecosystem Science
Parcs Canada-Rapports techniques en matière de sciences des écosystèmes

National Parks and Historic Sites | Parcs nationaux et lieux historiques

The fish community and use of the Kouchibouguac and Richibucto Estuaries by striped bass during the spring and summer of 1997 and 1998.

M. Robinson, S. Courtenay, T. Benfey, and E. Tremblay

January, 2001
Report 032

Maintaining Ecological Integrity of our Parks • Maintenir l'intégrité écologique de nos parcs

Atlantic Region, Parks Canada is producing three report series in ecosystem science. They are intended to communicate new scientific information, document scientific data, summarize existing knowledge, or offer technical recommendations. The primary function and the intended audience of a report determine the series in which it will be published. Each report series contains scientific and technical information that contributes to existing knowledge but is not in a form suitable for the primary journal literature.

- ***Parks Canada-Technical Reports in Ecosystem Science*** promote a wide distribution of scientific and technical information from Parks Canada's ecosystem investigations. The subject matter, and the series reflect the broad interest and policies of Parks Canada in ecosystem science. This series includes such work as, ecosystem and resource inventories, studies, surveys of species or guilds, and innovative management concepts.
- ***Parks Canada - Ecosystem Science Review Reports*** provides a forum for literature reviews, bibliographies, and reviews of management options that are often prepared for or by Parks Canada. Resource Descriptions and Analyses or chapters thereof will be published in this series.
- ***Parks Canada - Ecosystem Monitoring and Data Reports*** provide a medium for filing and achieving data compilations where little or no analysis is included. Such compilations commonly are prepared in support of primary publications or Technical Reports in Ecosystem Science. Raw data not available in a national data base and considered worth archiving is published as a Parks Canada - Ecosystem Monitoring and Data Report.

Ecosystem Science Reports are printed in the official language chosen by the author to meet the language preference of the likely audience, with an abstract in the second official language.

Objectives

Our objectives for these report series are:

- To communicate the results of ecosystem science research to the scientific and management communities, and to the public interested in Parks Canada environmental and conservation activities;
- To provide credible, accurate, and professional publications through a peer review process,
- To encourage creativity, effectiveness, and teamwork in conducting research and in providing information through publications.

Peer Review

The editor appoints two referees to critically review each manuscript. Referees are found, if possible, from scientific staff within Parks Canada. Due to areas of expertise, available time, and to avoid the potential of 'inbreeding' external reviewers will often be sought. Referees review the manuscript and return it to the editor with their written comments. The editor then returns the paper to the author(s) with the referee's comments. The author(s) consider(s) the referees' comments and incorporates those that they accept, into the report. The author(s) return(s) the revised manuscript to the editor and/or provides a written rationale for any exclusions of the referees' comments considered unacceptable. The editor then sends the revised manuscript to the Chief Park Warden or for the case of Regional Office staff to the author(s) direct supervisor for approval to publish and printing. At the editor's discretion, the appointment of referees may be dispensed with, if the publication is minor in nature. In such instances, the editor and the author's direct supervisor would assume the roles of the referees. In the unlikely event that an author and editor are in disagreement over a manuscript, the matter will be refereed to a Senior Departmental Manager for adjudication.

Directives for Authors

These series are intended for the publication of work in ecosystem science that is conducted in the Atlantic Region. They are available for use by any Parks Canada or Department of Canadian Heritage staff or others working in collaboration with, or on a contract to, the Department of Canadian Heritage.

The author(s) submits one paper copy of the completed draft of their paper and a digital version on a diskette in WordPerfect Windows or DOS format to the regional editor along with three suggested referees. Suggested referees should not have been previously involved with the manuscript.

Detailed instructions to authors can be obtained from:

Neil Munro
Report Series Editor
Parks Canada
Historic Properties
Halifax, Nova Scotia
B3J 1S9
(902) 426-2797
FAX 426-2728

Parks Canada - Technical Reports in Ecosystem Science

Report 032

The fish community and use of the Kouchibouguac and Richibucto Estuaries by striped bass during the spring and summer of 1997 and 1998.

by

M. Robinson [1], S. Courtenay [2], T. Benfey [3], and E. Tremblay [4]

January, 2001

[1] Zoology Dept., University of Guelph, Guelph, Ont., N1G 2W1

[2] Gulf Fisheries Centre, Dept. of Fisheries and Oceans, Box 5030, Moncton, NB, E1C 9B6

[3] Biology Dept., University of New Brunswick, Bag Service 45111, Fredericton, NB, E3B 5A3

[4] Kouchibouguac National Park, Kouchibouguac, NB, E0A 2A0

Canadian Cataloguing in Publication Data

Robinson, Mike, 1972 -

The fish community and use of the Kouchibouguac and Richibucto Estuaries by striped bass during the spring and summer of 1997 and 1998.

(Parks Canada – Technical reports in ecosystem science; no. 32)
Includes an abstract in French.
Includes bibliographical references and an index.

ISSN 1200-3298 no. 32
ISBN 0-662-29738-5
Catalogue No. R61-2/19-32-2000E

1. Striped bass – Ecology – New Brunswick – Kouchibouguac River Estuary (Kent).
2. Striped bass – Ecology – New Brunswick – Richibucto River Estuary.
I. Robinson, M.C. (Michael Christopher), 1972 -
II. Parks Canada, Atlantic Region
III. Title
IV. Series: Parks Canada – Technical reports in ecosystem science; no. 32

QL638.M678.F57 2000 597'.732'0971522 C00-980519-2

Published by authority of the Minister of Canadian Heritage
© Her Majesty the Queen in Right of Canada, represented by the Chief Executive Officer of Parks Canada, 2000

ISSN 1200-3298 no. 32
ISBN 0-662-29738-5
Catalogue No. R61-2/19-32-2000E

Contents

Abstract/Résumé ... iv
Introduction ... 1
Materials and Methods ... 2
Study Area ... 2
Physico-Chemical Data ... 3
Ichthyoplankton ... 3
Beach Seining ... 5
Fyke Nets ... 6
Results ... 7
Ichthyoplankton ... 7
Beach Seining ... 8
Fyke Nets ... 10
Young-of-the-year Striped Bass ... 10
Discussion ... 10
Species Composition ... 10
Striped bass spawning status ... 11
Presence of YOY Striped Bass ... 13
Research Recommendations ... 14
Conclusions ... 14
References ... 14
Tables ... 18
Figures ... 53
Appendices ... 61

Abstract

The purpose of this study was to determine the spawning status of striped bass (Morone saxatilis) in the Kouchibouguac and Richibucto Estuaries in 1997 and 1998. The pelagic spawning and littoral rearing habitat of the Kouchibouguac and Richibucto Estuaries were sampled for ichthyoplankton and juvenile fish during the spring and summer of both years. Although these two estuaries are historically believed to have supported striped bass spawning, no striped bass eggs or larvae were found during the ichthyoplankton surveys. Anadromous taxa such as rainbow smelt (Osmerus mordax) and gaspereau (Alosa spp.) were the dominant ichthyoplankton in both estuaries, whereas gasterosteids (sticklebacks) and fundulids (Fundulus spp.) were the dominant fauna in the littoral zones. White perch (Morone americana) larvae, which were abundant in the Richibucto River, were absent from the Kouchibouguac River. Although striped bass did not appear to spawn in these rivers in 1997 or 1998, small numbers of young-of-the-year were captured by beach seine in the Kouchibouguac Estuary in 1997 and in the Richibucto Estuary in both 1997 and 1998. The origin of these young-of-the-year striped bass was probably the Miramichi Estuary to the north which is known to support striped bass spawning.

Résumé

Le but de cette étude était de déterminer l'état de la reproduction du bar rayé (Morone saxatilis) dans l'estuaire des rivières Kouchibouguac et Richibouctou en 1997 et 1998. On a échantillonné au printemps et à l'été des deux années les habitats de ponte (pélagique) et de croissance (littoral) des estuaires des rivières Kouchibouguac et Richibouctou afin d'y énumérer l'ichthyoplancton et le poisson juvénile. Quoique traditionellement l'on soupçonne ces deux rivières de soutenir la ponte du bar rayé, aucun oeuf ou larve n'a été décelé durant les campagnes d'échantillonage. Les espèces anadromes telles l'éperlan arc-en-ciel (Osmerus mordax) et le gaspareau (genre Alosa) dominaient l'ichthyoplancton des deux estuaires, tandis que les gastérostéidés (épinoches) et fundulidés (genre Fundulus) prédominaient dans la faune des zones littorales. Les larves de bar-perche (Morone americana), qui abondaient dans la rivière Richibouctou, étaient absentes de la rivière Kouchibouguac. Quoique le bar rayé ne semble pas avoir frayé dans ces rivières en 1997 et 1998, on a capté quelques juvéniles de l'année à la senne de plage dans l'estuaire de la rivière Kouchibouguac en 1997 et celui de la rivière Richibouctou en 1997 et en 1998. Il est probable que ces juvéniles de l'année du bar rayé provenaient de l'estuaire de la rivière Miramichi, au nord, qui est reconnu comme soutien à la reproduction du bar rayé.

INTRODUCTION:

Estuaries in Atlantic Canada serve as spawning, rearing, and overwintering habitats for a diverse assemblage of fish species such as gaspereau (*Alosa* spp.), smelt (*Osmerus mordax*), and striped bass (*Morone saxatilis*) (Locke and Courtenay, 1995*a*, 1995*b*; Hanson and Courtenay, 1995). These species form the basis of important commercial and recreational fisheries in the region (Scott and Scott, 1988). In spite of the important role that estuaries play in maintaining populations of anadromous fishes, basic data concerning the early life history of these fishes have only been collected from a small number of these systems, including the Hillsborough (Johnston and Morse, 1988), Annapolis (Williams et al., 1984), Shubenacadie (Rulifson and Dadswell, 1995), Miramichi (McKenzie, 1959; Hanson and Courtenay, 1995; Locke and Courtenay, 1995*a*,*b*; Robichaud-Leblanc et al., 1996), St. Louis (Bernier et al., 1998), and Kouchibouguac Estuaries (Bernier et al., 1998; Robinson et al., 1998).

Previous studies have observed similar species assemblages in these rivers (Hanson and Courtenay, 1995; Locke and Courtenay, 1995*a*,*b*; Robichaud-Leblanc et al., 1996; Bernier et al., 1998; Robinson et al., 1998), but with higher species diversity in the larger systems, such as the Miramichi Estuary (Hanson and Courtenay, 1995; Locke and Courtenay, 1995*b*). Dominant ichthyoplankters are typically anadromous species such as the smelt, alewife (*Alosa pseudoharengus*), and blueback herring (*Alosa aestivalis*), while small fishes such as fundulids and gasterosteids usually dominate inshore littoral zones throughout most of the estuary (Hanson and Courtenay 1995; Robinson et al., 1998).

The collection of ichthyoplankton and juvenile fish distribution data is important for many reasons. This type of information serves as baseline data which can be used to detect long term changes in species assemblages through changing water or habitat quality. Ichthyoplankton and juvenile fish distribution data also serve to confirm spawning activity of certain species which may be the target of conservation efforts in a given area. In the southern Gulf of St. Lawrence, striped bass have been identified as a conservation priority by Kouchibouguac National Park (Tremblay and Beach, 1994), the Miramichi River Environmental Assessment Committee (MREAC, 1996), and the Richibucto River Association (St-Hilaire et al., 1997*a*). Within the southern Gulf of St. Lawrence (Figure 1), striped bass spawning has only been confirmed in the Miramichi Estuary (Robichaud-Leblanc et al., 1996). Studies in the Kouchibouguac River in 1996 (Robinson et al., 1998) found no evidence of striped bass spawning in the form of eggs and larvae, although small numbers of young-of-the-year (YOY) fish were present in late summer. Given the absence of earlier life history stages it was hypothesized that these YOY striped bass were migrants from another nearby estuarine system, such as the Miramichi Estuary to the north or the Richibucto Estuary to the south (Robinson et al., 1998).

The main objective of this research was to determine if the Kouchibouguac and Richibucto rivers support spawning populations of striped bass, or if they act as rearing habitat for young-of-the-year fish from other nearby estuaries, such as the Miramichi to the north.

To meet this objective, ichthyoplankton and beach seining surveys were conducted in 1997 and 1998 during the time when striped bass were expected to be spawning and later rearing in the littoral zone (Robichaud-Leblanc et al., 1996, 1998).

The secondary objective of this study was to use the ichthyoplankton and beach seining surveys to describe the fish communities of the Kouchibouguac and Richibucto Estuaries during the ice-free seasons of 1997 and 1998. This study represents the first effort to examine ichthyoplankton diversity and distribution within the Richibucto Estuary. These surveys were intended to detect any major differences in species assemblages between these two small neighboring estuaries within the southern Gulf of St. Lawrence.

MATERIALS AND METHODS:

STUDY AREA

Southern Gulf of St. Lawrence

Tides in the southern Gulf of St. Lawrence are mixed semi-diurnal (2 high and 2 low tides each day) (Miller et al., 1991). The currents are generally weak, and thus are easily influenced by strong winds which can change both their speed and direction from one day to the next (Miller et al., 1991). The section of coast from Richibucto to Point Escuminac (at the southern edge of Miramichi Bay) is usually exposed to strong northeasterly winds. Conditions in this area are often unpredictable due to shallow water and irregular seas (Miller et al., 1991). The highest of these seas often occur north of Kouchibouguac River, at Pointe Sapin (Miller et al., 1991). Ice formation in the Gulf usually begins in mid-December, and by January the Northumberland Strait is usually ice-covered (Miller et al., 1991). Ice breakup begins in the northwest Gulf of St. Lawrence and spreads southeast during April (Miller et al., 1991).

Kouchibouguac River System

The Kouchibouguac River (Figure 2) is located in eastern New Brunswick in Kouchibouguac National Park, and drains into Kouchibouguac Lagoon. It has a small estuary which drains a catchment basin of approximately 228 km^2 (Ambler 1975; Kerekes, 1977). The mean annual daily freshwater discharge rate of Kouchibouguac River is 3.74 m^3s^{-1} (Beach, 1988), and the tidal effects are mixed with a mean tidal amplitude of 0.67 m (Ambler, 1975; Kerekes, 1977). Tidal effects in the system, depending on the amount of surface runoff, can extend as far as a derelict hydroelectric dam located in Kouchibouguac Village approximately 15 km upriver (Kerekes, 1977). Kouchibouguac Lagoon is a shallow coastal bay separated from the Northumberland Strait by a 25 km long procession of barrier sand dune islands which protect it from the unpredictable high- energy conditions of Northumberland Strait. It has a total surface area of approximately 15 km^2, a maximum width of 600 m, and an average depth of approximately 1.5 m (S. Courtenay unpub. data) with depths averaging 3 m in the shipping channel (Ambler 1975; Kerekes 1977).

Richibucto River System

The Richibucto River Estuary is located approximately 20 km south of Kouchibouguac Lagoon (Figure 3). It is a small coastal watershed with a catchment basin covering approximately 1088.5 km^2 (St. Hilaire et al., 1997*b*). The average elevation is 45.5 m above sea level (Montreal Engineering Company 1969) and the mean annual freshwater discharge into the estuary is 26.0 m^3s^{-1} (St.-Hilaire et al., 1997*b*). The maximum rate of discharge (approximately 91.5 m^3s^{-1}) is usually reached in April immediately after ice-off (St.-Hilaire et al., 1997*b*). Richibucto River, along with a number of smaller tributaries, flows into Richibucto Bay, a large shallow basin with depths averaging 1m (St.-Hilaire et al., 1997*b*). There is a dredged channel 150 m wide and up to 12 m deep which flows through the center of the bay (St-Hilaire et al., 1997*b*). Richibucto Bay is separated from the Northumberland Strait by the same barrier sand dune islands that extend from Kouchibouguac National Park. Ice formation in the system usually occurs in November and the entire system is typically ice-free by April (St.-Hilaire et al., 1997*b*).

PHYSICO-CHEMICAL DATA

Samples of near-surface water (taken approximately 2 cm below the surface) and bottom water (taken approximately 10 cm above the bottom) were collected in mid-channel at each ichthyoplankton site using a Van Dorn bottle. The depth sampled ranged from approximately 1 to 8 m, depending on location. A hand-held refractometer with automatic temperature compensation (#A366ATC Ben Meadows Co., No. 221192, Atlanta, GA) and a thermometer (VWR No. C 1067-855, Halifax, N.S.) were used to immediately measure the salinity (‰) and temperature (°C) of each water sample. The refractometer was rinsed and recalibrated with distilled water between readings. Surface salinities were used to describe ichthyoplankton distribution as the bottom salinity values were often highly variable within a small area, presumably due to varying bottom topographies (Appendix A, B; Robinson, unpub. data). Previous studies within the southern Gulf of St. Lawrence have demonstrated that surface salinity is the most useful predictor of ichthyoplankon distributions within estuaries (Locke and Courtenay, 1995*a*; Bernier et al., 1998). Near-surface salinity and temperature (taken approximately 2 cm below the surface) readings were taken at each beach seining site approximately 2 m from shore with the same refractometer and thermometer used during the ichthyoplankton surveys.

ICHTHYOPLANKTON

Timing of Collections

Pelagic ichthyoplankton were collected approximately twice weekly in each river during late May and June (the months when striped bass were expected to be spawning) and biweekly thereafter. A total of 50 ichthyoplankton surveys were carried out during two field seasons: 25 in each of 1997 and 1998.

Exploratory surveys in the summer of 1997 were also conducted in the St. Louis River on July 2 and in the St. Charles River on July 10. Ichthyoplankton were also sampled from the Northwest Miramichi River during five ichthyoplankton surveys in 1998 on May 26, June 3, June 10, June 17, and July 8. The Northwest Miramichi River is an area in the southern Gulf of St. Lawrence where striped bass are known to spawn, probably on an annual basis, and was sampled to evaluate gear success for capturing striped bass eggs and larvae.

Method of Collections

Ichthyoplankton were collected with 1.0 m and 0.5 m diameter 0.5 mm mesh Nitex plankton nets. In 1997, the 1.0 m diameter, 3 m long net was used to sample deeper areas (>2m) in the Richibucto River while the smaller net was used in shallow water (<2m) and in the Kouchibouguac River. In 1998 the 0.5 m diameter, 1.5 m long net was used exclusively for all ichthyoplankton sampling. Ichthyoplankton were routinely collected by towing the net from a motorized boat for 10 min against the current at each ichthyoplankton station. The velocity of the boat was increased and decreased during each tow to allow the plankton net to undulate and thus sample the entire water column. Although the nets were usually towed by motorized boat, there were instances during low spring tides when some sampling stations were too shallow to allow for boat passage. In these instances the plankton net was fixed onto a 3 m long pole and manually walked against the current for 10 min. All ichthyoplankton samples were immediately preserved in 10% formalin buffered with $CaCO_3$ in ambient estuary water.

The amount of water sampled during each plankton tow was estimated with a TSK flowmeter (Tusurumi-Seiki-Kosakusho Co., Yokohama, Japan) that was mounted off-center in the mouth of each plankton net. The flowmeter was calibrated during a series of 12 vertical tows in low-current water approximately 5 m deep. During this procedure, the flowmeter was mounted on a 0.5 m diameter plankton net frame. The frame was lowered and raised through the water column 12 times, and flowmeter readings were taken at the beginning and end of each vertical tow. At the end of the tow series, the flowmeter readings were averaged and used to determine a constant value for the amount of water sampled per unit flow.

In 1997, the 0.5 m diameter net sampled an average of 75 m^3 water (range 3-222 m^3) during each ichthyoplankton tow. The 1.0 m diameter net sampled an average of 313 m^3 water (range 56-862 m^3) during each tow. In 1998, the 0.5 m diameter net sampled an average of 79 m^3 water (range 9-389 m^3) during each tow.

Calculation of Abundance Indices

Flowmeter readings were used to estimate the number of ichthyoplankton taxa per m^3 of water in each plankton sample. These values were then standardized to the number of ichthyoplankton (by taxa) per 100 m^3 of water. For each sampling day, ichthyoplankton counts from similar surface salinity ranges (0 ‰, 0.5-2.0 ‰, 2.5-4.0 ‰, 4.5-6.0 ‰, 6.5-

8.0 ‰, 8.5-10.0 ‰, and >10.0 ‰) were pooled to act as replicates in the interpretation of the data.

Location of Ichthyoplankton Collections

Sampling stations were chosen based on accessibility by boat and sampling gear, and by salinity profiles. River distance in km was measured for each of the ichthyoplankton sampling stations in the Kouchibouguac (Table 1) and Richibucto (Table 2) rivers. In each river, the station at or closest to the river mouth (i.e., lowest downriver station) was designated as km 0. All other stations were measured as km upriver or downriver from km 0. In the Kouchibouguac River (Fig. 2) 10 ichthyoplankton sampling stations were chosen along the main river. These stations ranged in distance from 0 km at Loggiecroft Wharf (0 km at station 4) to 12.2 km (station 13), a point just down river from Kouchibouguac Village (Table 1). Kouchibouguac River has no major tributaries therefore all sampling stations were located along the main river.

In the Richibucto River (Fig. 3) 8 ichthyoplankton sampling stations were chosen along the main river and its tributaries, ranging in distance from the bridge at Big Cove (16 km at station 24) to station 37, 34.5 km upriver (Table 2). In addition to sampling the main Richibucto River, two major tributaries were routinely sampled in both 1997 and 1998 for ichthyoplankton: Molus River (stations 25 and 26) and Bass River (stations 29 and 30) (Fig. 3).

Ichthyoplankton Identification

Ichthyoplankton were separated from other organic material (algae and invertebrates) with a hand magnifier and transferred from the 10% buffered formalin into a 70% ethanol solution. Ichthyoplankers were examined under 10X to 20X magnification with a Wild M3 stereo dissecting microscope and identified to lowest possible taxonomic level using a series of ichthyoplankton descriptions (Hardy, 1978; Drewry, 1981). The differentiation of white perch (*Morone americana*) from striped bass (*M. saxatilis*) larvae was verified by Dr. Lou Van Guelpen at the Atlantic Reference Centre of the Huntsman Marine Science Centre in St. Andrew's, New Brunswick. Clupeid (*Alosa spp.*) and fundulid *(Fundulus spp.*) ichthyoplankters were identified to genus only, and all gasterosteid ichthyoplankton (sticklebacks) were only identified to family.

BEACH SEINING

Timing of Collections

The inshore fish community was sampled during the summers of 1997 and 1998 in both the Kouchibouguac and Richibucto River systems. In both rivers, the inshore fish surveys were most intensive during July and August (Table 3), the months when juvenile striped bass were expected to be feeding and shoaling in the inshore habitat (Robichaud-LeBlanc et al., 1996, 1997, 1998). A total of 36 beach seining surveys were carried out during the two field seasons: 11 in 1997 and 25 in 1998. This included two exploratory

fall beach seining surveys in 1998: the Kouchibouguac River was sampled on September 9, and the Richibucto River was sampled on October 6.

Method of Collections

Juvenile fish were collected with a 25 m long by 1.5 m deep bag-style seine which was constructed with 6 mm mesh. The 3.4 m^3 purse of the net was fitted with a 0.9 mm nylon mesh liner to trap organisms as small as fish eggs and larvae. The liner was left in the net until early August, when juvenile striped bass would have grown large enough to be retained by the 6 mm mesh. The beach seine was deployed during each haul by securing one end of the net to the shore while the other end was manually towed perpendicular from shore for a distance of approximately 15-20 m. The seine was then brought into shore in a quarter-circle sweep. An area of approximately 240 m^2 was sampled with this method.

Location of Beach Seining Collections

Beach seining sampling stations were chosen based on accessibility by boat, shoreline profile, and salinity profiles. Beach seining was feasible only at sites with 5 to 10 flat, open shoreline which could receive the bag of the net when the seine was retrieved. In both the Kouchibouguac and Richibucto rivers the stations which were sampled by beach seine (Tables 1 and 2) were chosen based on shoreline accessibility and river distance and therefore varied slightly from year to year.

In the Kouchibouguac Estuary (Fig. 2), 13 beach seining stations were chosen, 8 of which were sampled routinely (Table 1). These stations ranged in distance from the southern tip of north Kouchibouguac Dune (-2.6 km at station 1) to 13.3 km (station 14), a point just down river of a derelict hydroelectric dam at Kouchibouguac Village (Table 1).

In the Richibucto River (Fig. 3), 37 beach seining stations were chosen along the main river and its tributaries, including the 8 stations used in the ichthyoplankton surveys (Fig. 3, Table 2). These stations ranged in distance from the breakwater at North Richibucto Dune (-11 km at station 1) to station 37, 34.5 km upriver (Table 2). In addition to sampling the main Richibucto River, two major tributaries were also routinely sampled for inshore fish communities: Molus River (stations 25, 26, and 27) and Bass River (stations 29 and 30) (Fig. 2).

FYKE NETS

Method of Collections

In late summer 1997 (August 20 to 29), juvenile fish were also sampled in Kouchibouguac River from a linear array of 4 fyke nets positioned near the mouth of the river (Fig. 2). The fyke nets were specially constructed to capture and retain small fishes. They were constructed of synthetic 1 cm stretch mesh and were fitted with single 6 m weighted leaders attached to the mouth of each net, allowing the traps to fish in both

directions. The depth of the nets ranged from approximately 0.5 m (low tide) to 2 m (high tide). The 4 nets were set in a slightly staggered line perpendicular from the shore near the river mouth. The nets were usually allowed to fish for 24 h before they were checked.

Identification of Inshore Fishes

All captured fish were immediately enumerated and identified to species whenever possible using standard identification keys for Atlantic Canadian fishes (Scott and Scott 1988). Fishes were counted and released as quickly as possible to avoid excessive mortalities. During six beach seining surveys in 1997 (July 11, August 18, 19, 21, 27, 28) fish species other than striped bass and white perch were not enumerated but were only recorded as present.

All *Morone* spp. were immediately preserved in 95% ethanol for later identification to avoid possible confusion between juvenile white perch and juvenile striped bass. Juvenile white perch and striped bass were later differentiated based on dorsal fin characteristics and anal fin spine lengths using a series of keys compiled by Drewry (1981) and Scott and Scott (1988).

RESULTS:

ICHTHYOPLANKTON

Mean daily surface temperatures and surface salinities measured during the 1997 (Table 4, Appendix A) and 1998 (Table 5, Appendix B) ichthyoplankton surveys fluctuated throughout the sampling period. Surface temperature increased rapidly during the first week of June in both the Kouchibouguac and Richibucto rivers (Fig. 4). Daily surface salinities at each sampling station varied throughout the 1997 and 1998 sampling seasons, presumably due to prevailing tides, winds, and currents. Ichthyoplankton surveys in the Kouchibouguac River in 1997 and 1998 were completed along a horizontal salinity gradient ranging from freshwater to 20‰, with most of the sampling falling within the 0 to 5‰ range (Fig. 5). In 1997 and 1998 in the Richibucto River, the horizontal salinity gradient along which ichthyoplankton were sampled ranged from 0 to 18‰, with the majority of samples collected from a range of 0 to 11‰ (Fig. 6).

A total of 13 taxa representing 8 families were identified from the ichthyoplankton samples (Table 6). Gaspereau, rainbow smelt, Atlantic tomcod, Atlantic silverside, and stickleback larvae were recovered from both rivers. Captures of larval banded killifish, mummichogs, white perch, and smooth flounder were restricted to the Richibucto River. Anadromous larvae (gaspereau and rainbow smelt) were the most abundant larvae throughout the 1997 and 1998 sampling seasons in both rivers. No striped bass eggs or larvae were found in any of the ichthyoplankton samples (Tables 6 to 10, Appendix C, Appendix D), nor was any striped bass spawning behavior observed during these surveys.

In the Kouchibouguac River in 1997 (Table 7), gaspereau were present in the ichthyoplankton samples from June 4 to July 31. Abundances peaked at 764 larvae m^{-3} H_2O at 0 ‰ on June 25 (Table 7). In 1998, they were captured from May 12 to July 20, with the highest abundance of 37 larvae m^{-3} H_2O at 0.5-2.0 ‰ observed on July 7 (Table 8). In the Richibucto River in 1997 (Table 9), gaspereau larvae were collected from May 29 to July 29 with peak abundance observed on June 26 (844 larvae m^{-3} H_2O at 0.5-2.0 ‰). In 1998, they were found from May 13 to July 21 (Table 10), with the peak abundance on July 6 at 471 larvae m^{-3} H_2O at 4.5-6 ‰.

In the Kouchibouguac River in 1997 (Table 7) smelt larvae were collected from May 20 to June 25 with the highest abundance (74 larvae m^{-3} H_2O at 0.5-2 ‰) observed on May 30. In 1998 abundance peaked at 279 larvae m^{-3} H_2O at 0 ‰ on May 28 (Table 8). Smelt larvae abundances in the Richibucto River in 1997 (Table 9) peaked on May 29 at 424 larvae m^{-3} H_2O at 0.5-2.0 ‰. In 1998, abundances were highest on May 21 at 533 larvae m^{-3} H_2O at 4.5-6.0 ‰ (Table 10).

White perch larvae were common in the Richibucto River in both 1997 and 1998 but were not captured in the Kouchibouguac River in either year (Table 6). In the Richibucto River in 1997, they were found in the ichthyoplankton samples from May 29 to July 14 with peak abundances of 98 larvae m^{-3} H_2O at 0.5-2.0 ‰ being observed on June 24 (Table 9). In 1998, abundances peaked at 69 larvae m^{-3} H_2O at 8.5-10.0 ‰ on June 4 (Table 10).

Larval abundances were plotted against sampling date and surface salinity values (Figs. 7 and 8) for the most common ichthyoplankton taxa from both rivers. In the Kouchibouguac River two main trends were apparent: smelt and gaspereau larval abundances were consistently highest at the lowest salinities sampled, and smelt captures were highest from late May to early June while gaspereau captures were highest from late June through August. In the Richibucto River, similar trends were seen. Smelt larvae were captured only during May and early June, whereas gaspereau larvae were mainly captured throughout the middle months of summer. The largest abundances of smelt and gaspereau were consistently seen at the lowest salinity ranges sampled. White perch were present in the ichthyoplankton samples from the Richibucto River in late June and early July in 1997 (Fig. 8), and in mid-June in 1998 (Fig. 8).

BEACH SEINING

Physico-chemical data collected during the beach seining surveys in the Kouchibouguac and Richibucto Rivers in 1997 and 1998 are presented in Table 11. Surface salinities sampled ranged from 0 ‰ to 33 ‰, and fluctuated throughout the sampling period (Appendices E and F). Surface temperatures also fluctuated during the sampling season reaching a maximum of 27.0 °C in the Richibucto River in 1998 on July 3 and August 10, and 26.0 °C on July 17 in the Kouchibouguac River. Throughout the sampling season the upriver stations were generally cooler and less saline than the downriver stations in both the Kouchibouguac and Richibucto Estuaries (Appendices E and F).

A total of 22 taxa representing 15 families were identified from the beach seining collections (Table 12). The data for several species do not accurately represent their presence: American eel, gaspereau, brook trout, rainbow smelt, and Atlantic tomcod are all fished heavily within the Kouchibouguac and Richibucto Estuaries and yet remained conspicuously absent from most of the seining samples (Table 12). These species were likely present within the littoral zone of the Kouchibouguac Estuary in larger numbers but were mobile enough to avoid our sampling gear, which targeted primarily juvenile or smaller fishes.

Brook trout were present in the late June and mid-July beach seining samples from Kouchibouguac River in 1997 and 1998 (Tables 13 and 14) but were not captured in the Richibucto River in either year (Tables 15 and 16). Rainbow smelt and white perch were present in the Richibucto River samples but were not captured in the Kouchibouguac River.

Fundulids (*Fundulus diaphanus* & *F. heteroclitus*), sticklebacks (*Gasterosteus aculeatus*, *Apeltes quadracus* & *Pungitius pungitius*), and Atlantic silversides (*Menidia menidia*) were numerically and spatially the most common taxa in both rivers (Table 12). Fundulids were captured throughout both sampling seasons. In the Kouchibouguac River in 1997 (Table 13) banded killifish were more abundant than mummichogs throughout the sampling area, especially at the upstream sampling stations. In 1998 (Table 14) banded killifish and mummichogs were enumerated together. In the Richibucto River in 1997 (Table 15) banded killifish were more abundant than mummichogs throughout the sampling area, with highest numbers observed at the upstream stations. The 2 fundulid species were counted together in 1998 in the Richibucto River (Table 16). In the Kouchibouguac River, threespine and fourspine sticklebacks were the most common gasterosteids throughout the sampling period, with the highest counts observed at the middle brackish water stations (Tables 13 and 14). In the Richibucto River, fourspine sticklebacks were the most abundant gasterosteid species (Tables 15 and 16). Atlantic silversides were common in the beach seining collections. They were present throughout the sampling period and were most abundant in the downstream sampling stations in both the Kouchibouguac (Tables 13 and 14) and Richibucto (Tables 15 and 16) Rivers.

White perch were abundant in the Richibucto River in both 1997 (Tables 12 and 15) and 1998 (Tables 12 and 16) but were not found in the samples collected from the Kouchibouguac River (Table 12). In the Richibucto River in 1997, they were first captured on July 11 at Station 32. On July 18, large numbers of YOY white perch were captured at Stations 26, 29, 32. In 1998, they were first captured on June 25 at Station 32. Large numbers were also found on July 13 at this station. White perch appeared to extend well upstream into the Coal Branch of the Richibucto River (stations 34-36) on the one date that it was sampled (August 18, 1997, Table 15), and were frequently collected at station 33, the mouth of the Coal Branch (Tables 15 and 16). They were present in the upper Richibucto River in 1997 (station 37) on August 18 (the only time this stations was sampled in 1997), and remained conspicuously absent from this area in 1998 (Table 16).

FYKE NETS

A total of 12 taxa representing 8 families was identified from fyke net traps set in Kouchibouguac Lagoon (Table 17). No species were captured in the fyke net array that were not represented in the beach seining catches from elsewhere in the Kouchibouguac Estuary.

YOUNG-OF-THE-YEAR STRIPED BASS

A total of 122 young-of-the-year striped bass were captured in the Kouchibouguac Estuary in 1997 through beach seine and fyke net sampling (Table 18). These fish were captured in the downstream area of the Estuary, between –2.6 km and 0 km. In spite of intensive seining efforts, no young-of-the-year striped bass were captured in the Kouchibouguac Estuary in 1998 (Table 14). In the Richibucto Estuary in 1997, 29 young-of-the-year striped bass were captured by beach seine sampling (Table 18). In 1998, a total of 22 young-of-the-year striped bass were captured in the Richibucto Estuary. Although most of the striped bass captured in the Richibucto Estuary in 1997 and 1998 were seined from the downstream sampling stations, fish were captured as far upriver as station 25 (the mouth of the Molus River), 17.8 km above Rexton (Table 18). The lengths of the striped bass captured (59.0 to 108.5 mm total length) clearly identified all of them as young-of-the-year fish (Table 18). Young-of-the-year striped bass rearing in the Miramichi Estuary attain lengths of up to 91 mm by the end of August (Robichaud-LeBlanc et al., 1998), which is comparable to the sizes of the fish captured in the Kouchibouguac and Richibucto Estuaries.

DISCUSSION:

SPECIES COMPOSITION

Taxonomic richness (number of taxa) within the Kouchibouguac and Richibucto Estuaries in 1997 and 1998 was less than recent measurements of richness within the Miramichi Estuary (Hanson and Courtenay, 1995; Locke and Courtenay, 1995*a*,*b*). The taxa which were dominant in the ichthyoplankton (smelt and gaspereau) and beach seining (fundulids, sticklebacks, and Atlantic silversides) samples in the Kouchibouguac and Richibucto Estuaries are also typically dominant in other southern Gulf of St. Lawrence estuaries, such as the Miramichi (Hanson and Courtenay, 1995; Locke and Courtenay, 1995*a*) and St. Louis (Bernier et al., 1998).

Fundulids and gasterosteids (sticklebacks) were the dominant fauna in the beach seining samples although they were not strongly represented in the ichthyoplankton samples. Their lack of representation in the ichthyoplankton samples is likely because both taxa spawn in the littoral zone (Scott and Scott, 1988), and their broods would have thus been inaccessible to plankton sampling gear that targeted pelagic spawners.

Two fish species, rainbow smelt and white perch, were found in the beach seining collections from the Richibucto River but were not represented in the seining collections from the Kouchibouguac River. Rainbow smelt larvae were numerically one of the most abundant ichthyoplankton taxa found in the Kouchibouguac River during 1997 and 1998. It is likely that, due to the small size of the Kouchibouguac River, juvenile smelt were transported out of the river before they settled inshore and became susceptible to the beach seining gear.

Although white perch were present in large numbers in the Richibucto River as both larvae and juveniles in both 1997 and 1998, no white perch were captured in the Kouchibouguac River. The reason for this is unknown. White perch range along the Atlantic coast from the upper St. Lawrence River to South Carolina in the USA (Scott and Scott, 1988). Throughout much of their range, white perch are considered to be a rapidly colonizing species capable of withstanding rapid changes in salinity and temperature during most stages of their life history (Hergenrader and Bliss, 1971; Holsapple and Foster, 1975; Bath and O'Conner, 1982; Bolieau, 1985; Scott and Scott, 1988). Historical biodiversity inventories of Kouchibouguac National Park (Kerekes, 1977; Desloges, 1979) found that white perch were present within the Park, but that their distribution was restricted to Lac À Livain, a small freshwater lake located in the Pointe-Sapin Bog near the north boundary of the Park. It is possible that white perch once spawned in Kouchibouguac River, but that the derelict hydroelectric dam located 14 km upriver has restricted their access to spawning habitat. The torrential spring flow through the dam's small fishway may be too rapid for adult spawners to negotiate when they seek out freshwater spawning grounds.

STRIPED BASS SPAWNING STATUS

Based on the ichthyoplankton and beach seining results it can be concluded that striped bass likely did not spawn in the Kouchibouguac or Richibucto Rivers in 1997 or 1998. If striped bass spawning had occurred it would have been temporally and geographically restricted to a small window of opportunity. The temporal and spatial restrictions that apply to striped bass spawning behavior are dependent on two main environmental variables: temperature and salinity. Surface temperature and surface salinity were used as proxy indicators of these conditions. Previous investigations of striped bass spawning in the southern Gulf of St. Lawrence and elsewhere have found that the initiation of spawning is closely related to rising water temperatures on the spawning grounds and not on absolute temperature (Setzler-Hamilton et al., 1981; Van Den Avyle and Maynard, 1994; Robichaud-LeBlanc et al., 1996). Previous work with striped bass eggs and larvae in the southern Gulf of St. Lawrence has also shown that they are generally distributed within a narrow salinity range (Robichaud-LeBlanc et al., 1996). Eggs are generally present in tidal fresh water, and larvae in waters with surface salinities $\leq$ 5 PSU (Robichaud-LeBlanc et al., 1996).

In the Kouchibouguac and Richibucto Rivers in 1997 and 1998, rapidly rising water temperatures were observed during late May and early June, the time when striped bass were expected to be spawning. In 1997, this occurred during the first and second weeks

of June; during this time, mean surface temperatures rose from approximately 12°C to 18°C. In 1998 rapidly rising water temperatures were observed during the second week of May and again during the first week of June. In May, mean surface water temperatures in the Kouchibouguac River rose from 11.7°C to 16.25°C in 2 days, from May 12 to May 14; in the Richibucto River, similar rises in temperature were observed during early June, when the water temperature rose from 14.27 °C to 19.50 °C in 1 week. Therefore, the temperature changes that are believed to trigger striped bass spawning were present in both rivers during both sampling years. Furthermore, both the Kouchibouguac and Richibucto River were extensively sampled for ichthyoplankton during these rapid temperature changes.

During the Kouchibouguac and Richibucto River ichthyoplankton surveys slightly saline to fresh water was sampled during approximately 95% of the surveys in 1997 and approximately 92% of the surveys in 1998. The salinity and temperature regimes that were sampled appeared appropriate for the projected distribution of striped bass eggs and larvae. It can thus be concluded that the lack of striped bass eggs and larvae in the ichthyoplankton collections from the Kouchibouguac and Richibucto Rivers was not attributable to inappropriate geographical or temporal sampling strategies.

Of the 13 taxa represented in the ichthyoplankton samples, several are known to commonly co-occur with striped bass eggs and larvae. Ichthyoplankton surveys in the Miramichi Estuary in 1995 (Locke and Courtenay, 1995*a*, *b*) found that gaspereau, rainbow smelt, Atlantic tomcod, fourspine stickleback, and threespine stickleback were all present in ichthyoplankton samples which also contained striped bass eggs or larvae. Furthermore, white perch larvae were found to co-occur with striped bass eggs and larvae in tidal freshwater (Locke and Courtenay, 1995*a*). Gaspereau, rainbow smelt, and gasterosteids were among the most abundant larvae collected during the ichthyoplankton surveys of the Kouchibouguac and Richibucto Rivers in 1997 and 1998. These collections also share many taxa in common with other published plankton surveys in the area (Locke and Courtenay, 1995*b*; Bernier et al., 1998; Robinson et al., 1998). The commonality of ichthyoplankton species composition between this study and others, combined with the abundant presence of white perch larvae in the Richibucto River collections, suggests that the sampling gear used was effective for the collection of pelagic larvae such as striped bass.

The ichthyoplankton sampling gear used in this study was also tested in the Northwest Miramichi River in an area where striped bass spawning is known to occur. Although smelt and gaspereau larvae were numerically the most abundant taxa in these collections, striped bass larvae were also collected (M. Robinson, unpub.data.). This serves as a gear test for the ichthyoplankton sampling methods, indicating that the gear used (i.e., boat, motor, net, etc.) was indeed effective for the collection of striped bass eggs and larvae. Thus, based on the ichthyoplankton and beach seining data, it can be concluded that small numbers of YOY striped bass migrated into the Richibucto River from another nearby estuary.

PRESENCE OF YOY STRIPED BASS

Although no evidence of striped bass spawning was found during the ichthyoplankton surveys in the Kouchibouguac and Richibucto Rivers in 1997 and 1998, YOY striped bass were found in the Kouchibouguac Estuary in 1997 and in the Richibucto River in both sampling seasons. There is a small possibility that these fish resulted from a spawning event in the Kouchibouguac or Richibucto rivers that the ichthyoplankton and beach seining surveys missed. It is, however, more likely the YOY striped bass captured in the Kouchibouguac and Richibucto rivers were migrants from another nearby estuary. Two main observations support this conclusion. First, no evidence of striped bass spawning was found in either the Kouchibouguac or Richibucto Estuaries in 1997 or 1998. Second, the time at which these fish were captured (late August) and the length at which they first appeared (over 70 mm) are inconsistent with YOY distribution data from other estuaries in the southern Gulf of St. Lawrence. Studies in the Miramichi Estuary in 1992 (Robichaud-LeBlanc et al., 1998) found that YOY striped bass were first captured inshore by beach seine during late June when they had reached a length of at least 12.0 mm TL. At the end of the summer in 1992, YOY striped bass were present in the greatest numbers in the more saline areas of the Miramichi Estuary (Robichaud-LeBlanc et al., 1998).

It is unknown why no YOY striped bass moved into the Kouchibouguac River in 1998 when they did in 1996 (Robinson et al., 1998) and 1997. It is possible that large floating mats of macroscopic algae that are prevalent inshore in the Kouchibouguac River in late summer effectively blocked YOY striped bass from exploiting the inshore littoral habitat. If this were the case, the YOY striped bass could have been present in the area but would have been inaccessible to the beach seining gear that was used. These algal mats also made beach seine sampling very difficult in the late summer of 1998, and could have reduced the sampling efficiency of the seining gear. It is also possible that YOY striped bass were present in the lower Kouchibouguac Estuary but not in the upper Kouchibouguac River. Early striped bass research within Kouchibouguac National Park (Melvin, 1979; Hogans and Melvin, 1984; Robinson et al., 1998) has indicated that YOY striped bass use this area as rearing habitat in at least some years. The Richibucto River served as rearing habitat for YOY striped bass in 1997 and 1998 although the magnitude of this use has yet to be quantified. Robinson et al. (1998) pointed to two likely sources for the YOY striped bass migrants found in 1996 in the Kouchibouguac River: the Miramichi Estuary to the North and the Richibucto Estuary to the South. At the time it was believed that these were the only two estuaries in the area large enough to support viable striped bass populations (Robinson et al., 1998). It now seems likely that the source of these migrants was not the Richibucto River, and that the migrant fish present in the Kouchibouguac River in recent years and in the Richibucto River in 1997 and 1998 immigrated from the Miramichi River striped bass population.

It is currently unknown if the YOY striped bass that move into the Kouchibouguac and Richibucto Rivers successfully overwinter in these systems, although it seems likely that some do. YOY striped bass with fork lengths of < 100 mm appear not to have good

winter survival rates in Miramichi River (Bernier, 1996; Bradford and Chaput, 1997). Older striped bass from the Miramichi Estuary are known to overwinter in the Kouchibouguac (Hogans and Melvin, 1984; Bradford et al., 2000) and Richibucto Rivers (Rulifson and Dadswell, 1995, Bradford and Chaput, 1996) above the salt wedge in fresh or near-fresh water, and YOY striped bass have been observed overwintering in the Richibucto River in recent years (R. Bradford, pers. comm.). The migration of YOY striped bass from the Miramichi River to overwintering sites in the Kouchibouguac and Richibucto estuaries could thus provide a mechanism for the re-colonization of other southern Gulf of St. Lawrence Rivers. This research has clearly demonstrated that the Kouchibouguac and Richibucto Estuaries provide rearing and possible overwintering habitat for YOY striped bass even if they are not presently supporting striped bass spawning.

RESEARCH AND MANAGEMENT RECOMMENDATIONS:

- Continue to monitor the Kouchibouguac and Richibucto Estuaries for intermittent striped bass spawning.
- Determine if immigrating YOY striped bass successfully overwinter in the Kouchibouguac and Richibucto rivers to eventually contribute to the southern Gulf of St. Lawrence Stock.
- In lieu of a striped bass recreational fishery in the Richibucto River, the potential for an enhanced white perch fishery should be investigated.

CONCLUSIONS:

The Kouchibouguac and Richibucto Rivers continue to support a diverse and abundant ichthyofauna community, which occasionally includes migrant YOY striped bass, likely from the Miramichi Estuary. These rivers are also important spawning and rearing habitat for a number of commercially important fish species. Active fisheries are present in both river systems for smelt, gaspereau, and eels. Although striped bass did not spawn in the Kouchibouguac or Richibucto Rivers in 1997 or 1998, it is possible that striped bass still use these rivers as spawning habitat in intermittent years. Based on the data presented here, it is not possible to completely discount striped bass spawning in the Kouchibouguac and Richibucto Rivers, which may occur in years when striped bass abundances in the southern Gulf of St. Lawrence are not at critically low levels.

REFERENCES:

Ambler, D.C. 1975. Hydrological inventory of Kouchibouguac National Park, New Brunswick, Canada. Environment Canada, Inland Waters Directorate, Water Resources Branch, Halifax, Canada. 190 p.

Bath, D.W., and J.M. O'Conner. 1982. The biology of the white perch, *Morone americana*, in the Hudson River estuary. Fish. Bull. 80: 599-610.

Beach, H. (Ed) 1988. The resources of Kouchibouguac National Park: resource description and analysis. Kouchibouguac National Park, Environment Canada National Parks: 930 p.

Bernier, R. 1996. Relation entre la tailee automnale et la survie hivernale de bar rayé (*Morone saxatilis*) de la rivière Miramichi. Thèse d'Initiation à la Recherche. Université de Moncton, Moncton, New Brunswick.

Bernier, R., S. Desormeaux, E. Tremblay, A. Locke, I. Kaczmarska, G. Klassen, and P. Strain. 1998. Plankton community structure and productivity in the Kouchibouguac National Park Estuaries: Part I, Preliminary results from the ice-free season, 1997. Parks Canada Eco. Monit. Data Rep. 149 p.

Bolieau, M.G. 1985. The expansion of white perch, *Morone americana*, in the lower Great Lakes. Fisheries 10: 6-10.

Bradford, R.G. and G. Chaput. 1996. Status of striped bass (*Morone saxatilis*) in the Gulf of St. Lawrence in 1995. Department of Fisheries and Oceans Atlantic Research Document 96/01: 36 p.

Bradford, R.G. and G. Chaput. 1997. Status of striped bass (*Morone saxatilis*) in the Gulf of St. Lawrence in 1996 and revised estimates of spawner abundance for 1994 and 1995. Department of Fisheries and Oceans Atlantic Research Document 97/16: 28 p.

Bradford, R.G., D. Cairns, and B. Jessop. 2000. Update on the status of striped bass (*Morone saxatilis*) in eastern Canada in 1998. Department of Fisheries and Oceans Canadian Stock Assessment Secretariat Res. Doc. 00/XX: 18 p.

Desloges, C. 1979. The natural resources of Kouchibouguac National Park. Parks Canada Atlantic Region. 127 p.

Drewry, G.E. 1981. Externally visible features useful for separating young of striped bass (*Morone saxatilis*) from those of white perch (*Morone americana*) in the Chesapeake Bay region. Rapp. P. Réun. Cons. Int. Explor. Mer. 178: 590-592.

Hanson, J.M., and S.C. Courtenay. 1995. Seasonal abundance and distribution of fishes in the Miramichi Estuary, p. 141-160. *In* E.M.P. Chadwick [*editor*]. Water, science, and the public: the Miramichi ecosystem. Can. Spec. Publ. Fish. Aquat. Sci. 123.

Hardy, J.D., Jr. 1978. Development of fishes of the Mid-Atlantic Bight: an atlas of the egg, larval, and juvenile stages. Vol III. Aphredoderidae through Rachycentridae. U.S. Fish. Wildl. Serv., Biol. Serv. Prog. FWS/OBS - 78/12. 394p.

Hergenrader, G.L., and Q.P. Bliss. 1971. The white perch in Nebraska. Trans. Amer. Fish. Soc. 4: 734-738.

Hogans, W., and G. Melvin. 1984. Kouchibouguac National Park striped bass (*Morone saxatilis*) fishery survey. Aquatic Industries Limited. St Andrew's, New Brunswick.: 91p.

Holsapple J.G., and L.E. Foster. 1975. Reproduction of white perch in the lower Hudson River. New York Fish and Game Journal. 22: 122-127.

Johnston, C.E., and M. Morse. 1988. Summer ichthyoplankton communities of two estuarine systems of Prince Edward Island. Can. J. Zool., 66: 737-745.

Kerekes, J. 1977. Aquatic Resources Inventory: Kouchibouguac National Park, New Brunswick. Unpublished Report to Parks Canada. Environment Canada, Canadian Wildlife Service, Halifax, N.S. 139 p.

Locke, A. and S.C. Courtenay. 1995*a*. Effects of environmental factors on ichthyoplankton communities in the Miramichi Estuary, Gulf of St. Lawrence. J. Plankton Res. 17: 333-349.

Locke, A. and S.C. Courtenay. 1995*b*. Ichthyoplankton and invertebrate zooplankton of the Miramichi Estuary: 1918-1993, p 97-120. *In* E.M.P. Chadwick [*editor*]. Water, science, and the public: the Miramichi ecosystem. Can. Spec. Publ. Fish. Aquat. Sci. 123.

McKenzie, R.A. 1959. Marine and freshwater fisheries of the Miramichi River and estuary, New Brunswick. J. Fish. Res. Board Can. 16: 807-833.

Melvin, G. 1979. A survey of striped bass (*Morone saxatilis*) in Kouchibouguac National Park, New Brunswick. Parks Canada: St. Andrew's New Brunswick: The Huntsman Marine Laboratory. 32 p.

Miller, S., T. McIldoon, D. Steeves, D. Kearney, and J.M. Gray. 1991. Gulf of St. Lawrence Marine Weather Guide. Environment Canada Atlantic Region, Halifax. 82 p.

Montreal Engineering Company. 1969. Maritime provinces water resources study. Stage 1, Vol 3, Book 3.

MREAC (Miramichi River Environmental Assessment Committee). 1996. Miramichi watershed environmental management plan – reaching 2002. 100 p.

Robichaud-LeBlanc, K.A., S.C. Courtenay, and A. Locke. 1996. Spawning and early life history of a northern population of striped bass (*Morone saxatilis*) in the Miramichi River estuary, Gulf of St. Lawrence. Can. J. Zool. 74: 1645-1655.

Robichaud-LeBlanc, K.A., S.C. Courtenay, and J.M. Hanson. 1997. Ontogenetic diet shifts in age-0 striped bass, *Morone saxatilis*, from the Miramichi River estuary, Gulf of St. Lawrence. Can. J. Zool. 75: 1300-1309.

Robichaud-LeBlanc, K.A., S.C. Courtenay, and T.J. Benfey. 1998. Distribution and growth of young-of-the-year striped bass in the Miramichi River estuary, Gulf of St. Lawrence. Trans. Am. Fish. Soc. 127: 56-69.

Robinson, M., G. Klassen, A. Locke, A. Verschoor, E. Tremblay, A. St-Hilaire, and S. Courtenay. 1998. A preliminary survey of the early life history of striped bass (*Morone saxatilis*) in the Kouchibouguac Estuary in 1996. Tech. Rep. Eco. Sci. 12: 38 p.

Rulifson, R. A. , and M. J. Dadswell. 1995. Life history and population characteristics of striped bass in Atlantic Canada. Trans. Amer. Fish. Soc. 114: 244-249.

Scott, W. B., and M. G. Scott. 1988. Atlantic Fishes of Canada. Can. Bull. Fish. Aquat. Sci. 219: 731 p.

St. Hilaire, A., A. Boghen, and S.C. Courtenay. 1997*a*. Richibucto River Association Action Plan. Environmental Sciences Research Centre, Université de Moncton. 26 p.

St.Hilaire, A., A.D. Boghen, and S.C. Courtenay. 1997*b*. Physical oceanography of the Richibucto Estuary (New Brunswick): Autumn conditions in 1995. Can. Tech. Rep. Fish. Aquat. Sci. 2167: 10 p.

Setzler-Hamilton, E.M., W.R., Boyton, J.A. Mihursky, T.T. Polgar, and K.V. Wood. 1981. Spatial and temporal distribution of striped bass eggs, larvae, and juveniles in the Potomac Estuary. Trans. Amer. Fish. Soc. 110: 121-136.

Tremblay, E., and H. Beach. 1994. Kouchibouguac National Park: Ecosystem Conservation Plan. Heritage Canada, Parks Canada, Atlantic Region. 94 p.

Van Den Avyle, and M.J. Maynard. 1994. Effects of salt-water intrusion and flow diversion on reproductive success of striped bass in the Savannah River estuary. Trans. Amer. Fish. Soc. 123: 886-903.

Williams, R.R., G.R. Daborn, and B.M. Jessop. 1984. Spawning of the striped bass (*Morone saxatillis*) in the Annapolis River, Nova Scotia. Proc. N.S. Inst. Sci. 34: 15-23.

Table 1: Location of ichthyoplankton and beach seine sampling stations in the Kouchibouguac River in May-August 1997 and 1998 illustrating stations that were sampled (✓) and were not sampled (✗) during each year. Distances were measured following the river curves in mid-river using a map wheel on 1:35 000 Kouchibouguac National Park Maps # 21-I/14 and 21-I/15. The commercial fishing wharf at Loggiecroft was designated as km 0.

Station Number	Distance from km 0	Ichthyoplankton		Beach Seining	
	(Loggiecroft)	1997	1998	1997	1998
1	-2.6	✗	✗	✓	✓
2	-2.8	✗	✗	✓	✗
3	-1.5	✗	✗	✗	✓
4	0.0	✗	✓	✓	✓
5	2.2	✗	✓	✓	✓
6	3.1	✗	✓	✓	✓
7	4.6	✓	✓	✓	✓
8	6.3	✓	✓	✓	✓
9	7.6	✓	✓	✓	✓
10	8.8	✓	✓	✓	✓
11	10.3	✓	✓	✓	✓
12	11.1	✓	✓	✓	✗
13	12.2	✓	✓	✗	✗
14	13.3	✗	✗	✗	✓

Table 2: Location of ichthyoplankton and beach seine sampling stations in the Richibucto River in May-August 1997 and 1998 illustrating stations that were sampled (✓) and were not sampled (✗) during each year. Distances were measured following the river curves in mid-river using a map wheel on 1:50 000 Department of Natural Energy and Resources Maps #21-I/10 and 21-I/11. The town of Rexton was designated at km 0.

Station Number	Distance from km 0	Ichthyoplankton		Beach Seining	
	(Rexton)	1997	1998	1997	1998
1	-11.0	✗	✗	✓	✓
2	-10.7	✗	✗	✗	✓
3	-12.1	✗	✗	✓	✗
4	-10.5	✗	✗	✓	✗
5	-7.0	✗	✗	✓	✓
6	-9.1	✗	✗	✓	✓
7	-13.0	✗	✗	✓	✗
8	-15.1	✗	✗	✓	✗
9	-16.6	✗	✗	✓	✗
10	-17.2	✗	✗	✓	✗
11	-6.8	✗	✗	✗	✓
12	-9.3	✗	✗	✗	✓
13	-5.0	✗	✗	✗	✓
14	-3.4	✗	✗	✓	✓
15	-5.0	✗	✗	✗	✓
16	-3.0	✗	✗	✓	✗
17	0.0	✗	✗	✓	✓
18	3.2	✗	✗	✗	✓
19	3.4	✗	✗	✓	✓
20	8.0	✗	✗	✓	✓
21	8.8	✗	✗	✓	✓
22	11.0	✗	✗	✓	✗
23	15.6	✗	✗	✓	✓
24	16.0	✓	✓	✓	✓
25	17.8	✓	✓	✓	✓
26	19.8	✓	✓	✓	✓
27	20.7	✗	✗	✓	✓
28	20.5	✗	✗	✓	✓
29	22.5	✓	✓	✓	✓
30	24.0	✓	✓	✓	✓
31	24.2	✓	✓	✓	✓
32	26.5	✓	✓	✓	✓
33	27.5	✗	✗	✓	✓
34	29.0	✗	✗	✓	✗
35	29.8	✗	✗	✓	✗
36	32.0	✗	✗	✓	✗
37	34.5	✓	✓	✓	✓

Table 3: List of beach seining surveys in the Kouchibouguac and Richibucto Estuaries in 1997 and 1998, organized by month and year.

River and Year	Month and number of beach seining surveys				
	June	July	August	September	October
Kouchibouguac 1997	0	1	3	0	0
Kouchibouguac 1998	2	2	6	1	0
Richibucto 1997	0	3	6	0	0
Richibucto 1998	1	6	6	0	1

Table 4: Environmental variables measured during the 1997 ichthyoplankton surveys in the Kouchibouguac and Richibucto Rivers. "N" refers to the number of stations sampled during a particular ichthyoplankton survey.

Date	River	N	Salinity (‰)		Temperature (°C)		
			Surface	Bottom	Mean Surface	Surface	Bottom
May 15	Kouchibouguac	3	0-4	1-29	10.40	10.5-12	7-11
May 20	Kouchibouguac	3	0	0-20	10.33	10-11	8-10
May 28	Richibucto	1	3	7	13.00	13	12
May 29	Richibucto	5	0-7	0-10	14.21	13-17	12-13
May 30	Kouchibouguac	5	0.5-1.5	0.5-23	13.40	12.5-14.5	8.5-13
June 3	Richibucto	3	0-6	0-7	14.38	14-14.5	14
June 4	Kouchibouguac	5	0-2	0-22	12.00	11-13	10-12
June 5	Richibucto	4	0-3	1-5	13.08	13-13.5	13-13.5
June 10	Richibucto	5	0	0-8	18.00	17-19	14.5-19
June 11	Kouchibouguac	3	0	0-20	17.80	17.5-18	13-18
June 12	Richibucto	7	0-5	0-11	18.43	16-20	15.5-19
June 13	Kouchibouguac	7	0-3	0-23	15.36	14-16.5	13-14
June 17	Richibucto	1	2	2	18.00	18	18
June 19	Richibucto	3	1-5	4-5	18.14	18-19	18-19
June 23	Kouchibouguac	5	0-5	12-18	16.50	16-17	15-16
June 24	Richibucto	6	0-8	0-13	18.00	14-20	13-19
June 25	Kouchibouguac	7	0-5	0.5-22	15.64	14-17	14-16
June 26	Richibucto	5	0-2	0-9	16.88	14-18	14-19
July 1	Kouchibouguac	4	0-1	0-11	20.63	20-21.5	18-21
July 2	St.Louis	4	0-5	5.5-24	23.50	23-24	19-22
July 3	Richibucto	7	0-5	0-13	22.63	21-24	20-23
July 9	Kouchibouguac	5	0-3	6-18	18.00	17-19	11-17
July 10	St.Charles	2	7	10	17.00	18	18
July 14	Richibucto	7	0-7	0-22	20.00	18-24	15-23
July 17	Kouchibouguac	5	0-1	12-26	19.80	17-22	16-18
July 29	Richibucto	4	5-15	11-15	22.17	21-23	20-22
July 31	Kouchibouguac	6	1-10	5-25	21.00	20-22	19-21

Table 5: Environmental variables measured during the 1998 ichthyoplankton surveys in the Kouchibouguac and Richibucto Rivers. "N" refers to the number of stations sampled during a particular ichthyoplankton survey.

Date	River	N	Salinity (‰)		Temperature (°C)		
			Surface	Bottom	Surface Mean	Surface	Bottom
May 12	Kouchibouguac	8	0-4	0-26	11.70	10-12	9-10
May 13	Richibucto	5	0-6	0-7	11.36	9-13	8-10
May 14	Kouchibouguac	7	0-7	9-25.5	16.25	15-17	11-18
May 15	Richibucto	6	1-5	2-8	14.79	14-18	8.5-12
May 19	Richibucto	6	0-10	4-16	13.86	10-15	8-15
May 20	Kouchibouguac	5	0-4	13.5-18	13.40	11.5-15	12-14
May 21	Richibucto	6	0-8	2-17	16.86	16-17	14-18
May 27	Richibucto	7	1-15	1-14	16.29	15-17	12-16
May 28	Kouchibouguac	7	0-6	16-24	15.00	12-17	13-15
May 29	Richibucto	6	0-8	0-9	17.43	16-19	14-19
June 2	Kouchibouguac	6	0-5	0-23	15.56	13-16	12-13
June 4	Richibucto	8	0-10	0-24	14.27	13-15	13-16
June 5	Kouchibouguac	4	0-20	0-20	10.40	10-11	10-12
June 11	Richibucto	8	0-10	0-15	19.50	18-20	16-20
June 12	Kouchibouguac	6	0-6	0-21	17.33	16-18	14-17
June 15	Kouchibouguac	4	0-4	15-22	17.50	17-18	15-16
June 16	Richibucto	8	0-11	0-16	18.44	18-19	17-20
June 18	Richibucto	8	0-11	0-17	20.44	19-21	17-21
June 19	Kouchibouguac	7	0-4	0-24	18.29	17-20	17-19
July 6	Richibucto	5	0-12	2-22	23.00	21-24	17-24
July 7	Kouchibouguac	7	0-5	1-21	20.86	19-22	18-21
July 20	Kouchibouguac	7	0-12	20-26	22.57	22-23	20-22
July 21	Richibucto	6	5-17	10-18	24.43	23-26	23-25
August 4	Kouchibouguac	5	1-11	20-25	22.20	22-22.5	18-20.5
August 5	Richibucto	5	10-18	16-23	22.60	22-24	18-21

Table 6: Ichthyoplankton taxa captured in the Kouchibouguac and Richibucto Rivers during the 1997 and 1998 ichthyoplankton surveys. Relative abundances are presented as abundant (> 100 individuals per 100 m^3 water typically collected), common (10 to 100 individuals per 100 m^3 water typically collected), scarce (5 to 9 individuals per 100 m^3 water typically collected), rare (< 5 individuals per 100 m^3 water collected on 2 or less occasions), and absent (no individuals collected).

River and Year			
Kouchibouguac 1997	Kouchibouguac 1998	Richibucto 1997	Richibucto 1998
CLUPEIDAE			
Alosa spp.: *A. pseudoharengus* (Wilson, 1811) and *A. aestivalis* (Mitchell, 1815): gaspereau			
Abundant	Abundant	Abundant	Abundant
OSMERIDAE			
Osmerus mordax (Mitchell, 1815): rainbow smelt			
Abundant	Abundant	Abundant	Abundant
GADIDAE			
Microgadus tomcod (Walbaum, 1792): Atlantic tomcod			
Absent	Rare	Rare	Absent
CYPRINODONTIDAE			
Fundulus diaphanus (Lesueur, 1817): banded killifish; *F. heteroclitus* (Linnaeus, 1766): mummichog			
Absent	Absent	Scarce	Rare
ATHERINIDAE			
Menidia menidia (Linnaeus, 1766): Atlantic silverside			
Rare	Common	Rare	Common
GASTEROSTEIDAE			
Gasterosteus aculeatus (Linnaeus, 1758): threespine stickleback; *G. wheatlandi* (Putnam, 1866): blackspotted stickleback; *Apeltes quadracus* (Mitchell, 1815): fourspine stickleback; *Pungitius pungitius* (Linnaeus, 1758): ninespine stickleback			
Common	Common	Common	Common
PERCICTHYIDAE			
Morone americana (Gmelin, 1788): white perch			
Absent	Absent	Common	Common
PLEURONECTIDAE			
Pleuronectes putnami (Gill, 1864): smooth flounder			
Absent	Absent	Rare	Rare

Table 7: Mean abundance (number per 100 m^3 water) of ichthyoplankton taxa in the Kouchibouguac River in summer 1997 by surface salinity and date. Taxa are organized according to phylogeny. Only dates when taxa were collected are shown. A hyphen (-) indicates a salinity range which was not sampled on a particular date. Parentheses () are used to indicate egg abundance. Numbers without parentheses indicate larval abundance.

Taxon & date	Surface salinity (‰)						
	0	0.5-2.0	2.5-4.0	4.5-6.0	6.5-8.0	8.5-10.0	>10.0
CLUPEIDAE (Herrings)							
Alosa spp.: *A. pseudoharengus* (Wilson, 1811) and *A. aestivalis* (Mitchill, 1815): gaspereau							
June 4	(43.4)	0.0	-	-	-	-	-
June 13	12.4 (5.8)	0.0	-	-	-	-	-
June 23	34.4	-	21.9	21.6	-	-	-
June 25	764.1 (492.1)	-	30.6	1.5	-	-	-
July 1	1.4	15.9	-	-	-	-	-
July 9	13.4	-	3.4	-	-	-	-
July 17	3.6	5.1	-	-	-	-	-
July 31	-	7.1	-	6.2	-	0.0	-
OSMERIDAE (Smelts)							
Osmerus mordax (Mitchell, 1815): rainbow smelt							
May 20	(1.6)	-	-	-	-	-	-
May 30	-	73.7	-	-	-	-	-
June 4	5.7	28.8	-	-	-	-	-
June 13	0.0	9.1	15.3	-	-	-	-
June 23	0.0	-	1.0	0.0	-	-	-
June 25	0.0	-	1.5	0.0	-	-	-
ATHERINIDAE (Silversides)							
Menidia menidia (Linnaeus, 1766): Atlantic silverside							
June 23	0.0	-	0.0	2.9	-	-	-
GASTEROSTEIDAE (Sticklebacks)							
G. aculeatus (Linnaeus, 1758): threespine stickleback, *G.wheatlandi* (Putnam, 1866): blackspotted stipckleback, *Apeltes quadracus* (Mitchell, 1815): fourspine stickleback, *Pungitius pungitius* (Linnaeus, 1758): ninespine stickleback							
June 4	1.9	0.0	-	-	-	-	-
June 23	0.9	-	-	0.0	-	-	-
June 25	0.0	-	1.1	0.0	-	-	-
July 17	1.2	0.0	-	-	-	-	-

Table 8: Mean abundance (number per 100 m^3 water) of ichthyoplankton taxa in the Kouchibouguac River in summer 1998 by surface salinity and date. Taxa are organized according to phylogeny. Only dates when taxa were collected are shown. A hyphen (-) indicates a salinity range which was not sampled on a particular date.

Taxon & date	Surface salinity (‰)						
	0	0.5-2.0	2.5-4.0	4.5-6.0	6.5-8.0	8.5-10.0	>10.0
CLUPEIDAE (Herrings)							
Alosa spp.: *A. pseudoharengus* (Wilson, 1811) and *A. aestivalis* (Mitchill, 1815): gaspereau							
May 12	1.5	2.8	0.0	-	-	-	-
May 28	0.0	0.0	-	8.6	-	-	-
June 2	1.7	0.0	-	0.0	-	-	-
June 12	1.3	-	0.0	0.0	-	-	-
June 19	10.8	0.0	0.0	-	-	-	-
July 7	32.8	37.0	19.7	0.0	-	-	-
July 20	0.0	-	1.8	7.0	-	-	1.0
OSMERIDAE (Smelts)							
Osmerus mordax (Mitchell, 1815): rainbow smelt							
May 12	238.4	52.3	64.0	-	-	-	-
May 14	28.7	-	-	4.5	214.4	-	-
May 20	39.1	-	2.4	-	-	-	-
May 28	279.1	180.8	-	107.7	-	-	-
June 2	39.6	13.8	-	0.0	-	-	-
June 5	0.9	0.0	-	-	-	-	0.0
June 12	1.3	-	0.0	6.6	-	-	-
July 7	0.0	0.0	0.0	23.4	-	-	-
ATHERINIDAE (Silversides)							
Menidia menidia (Linnaeus, 1766): Atlantic silverside							
June 19	1.1	0.0	83.9	-	-	-	-
July 7	0.0	0.0	14.0	9.1	-	-	-
July 20	0.0	-	0.0	0.0	-	-	27.6
August 4	-	9.7	-	0.0	-	0.0	0.0
GASTEROSTEIDAE (Sticklebacks)							
G. aculeatus (Linnaeus, 1758): threespine stickleback, *G.wheatlandi* (Putnam, 1866): blackspotted stipckleback, *Apeltes quadracus* (Mitchell, 1815): fourspine stickleback, *Pungitius pungitius* (Linnaeus, 1758): ninespine stickleback							
May 28	2.2	0.0	-	0.0	-	-	-
June 15	0.0	0.0	1.6	-	-	-	-
June 19	1.1	223.1	0.0	-	-	-	-
July 7	13.7	0.0	0.0	0.0	-	-	-
July 20	0.0	-	0.0	9.8	-	-	1.0
August 4	-	1.3		4.4	-	0.0	0.0

Table 8 (con't.)

Taxon & date	Surface salinity (‰)						
	0	0.5-2.0	2.5-4.0	4.5-6.0	6.5-8.0	8.5-10.0	>10.0
GADIDAE (Codfishes)							
Microgadus tomcod (Walbaum, 1792): Atlantic tomcod							
May 14	1.9	-	-	0.0	0.0	-	-

Table 9: Mean abundance (number per 100 m^3 water) of ichthyoplankton taxa in the Richibucto River in summer 1997 by surface salinity and date. Taxa are organized according to phylogeny. Only dates when taxa were collected are shown. A hyphen (-) indicates a salinity range which was not sampled on a particular date. Parentheses () are used to indicate egg abundance. Numbers without parentheses indicate larval abundance.

Taxon & date	Surface salinity (‰)						
	0	0.5-2.0	2.5-4.0	4.5-6.0	6.5-8.0	8.5-10.0	>10.0
CLUPEIDAE (Herrings)							
Alosa spp.: *A. pseudoharengus* (Wilson, 1811) and *A. aestivalis* (Mitchill, 1815): gaspereau							
May 29	6.4	0.0	-	-	0.0	-	-
June 3	1.4	0.0	-	0.0	-	-	-
June 10	832.6 (26.6)	-	-	-	-	-	-
June 12	0.0	-	0.0	16.7	-	-	-
June 17	-	0.0	-	-	-	-	-
June 19	-	-	-	-	-	-	-
June 24	(393.1)	0.0	-	-	0.0	-	-
June 26	(180.8)	843.9	-	-	-	-	-
July 3	446.5 (0.4)	202.5	-	198.2	-	-	-
July 14	97 (175.1)	198.4	3.6	0.0	7.2	-	-
July 29	-	-	-	24.5	2.1	2.7	0.0
OSMERIDAE (Smelts)							
Osmerus mordax (Mitchell, 1815): rainbow smelt							
May 28	-	-	0.0	-	-	-	-
May 29	17.2	424.3	-	-	50.5	-	-
June 3	31.8	-	-	103.1	-	-	-
June 5	23.5	-	41.2	-	-	-	-
June 10	170.6 (0.4)	3.9	-	-	-	-	-
June 12	0.0	-	1.6	0.0	-	-	-
June 19	-	0.0	-	0.0	-	-	-
July 3	0.7	1.2	-	0.0	-	-	-
GADIDAE (Codfishes)							
Microgadus tomcod (Walbaum, 1792): Atlantic tomcod							
June 3	0.2	-	-	0.0	-	-	-
June 5	0.8	-	0.0	-	-	-	-
CYPRINODONTIDAE (Killifishes)							
Fundulus spp. (*F. diaphanus* (Lesueur, 1817): banded killifish, *F. heteroclitus* (Linnaeus, 1766): mummichog							
June 26	0.0	1.6	-	-	-	-	-
July 29	-	-	-	0.0	7.7	0.0	0.0
ATHERINIDAE (Silversides)							
Menidia menidia (Linnaeus, 1766): Atlantic silverside							
July 3	0.0	11.7	-	0.0	-	-	-

Table 9 (con't.)

Taxon & date	Surface salinity (‰)						
	0	0.5-2.0	2.5-4.0	4.5-6.0	6.5-8.0	8.5-10.0	>10.0
GASTEROSTEIDAE (Sticklebacks)							
G. aculeatus (Linnaeus, 1758): threespine stickleback, *G.wheatlandi* (Putnam, 1866): blackspotted stipckleback, *Apeltes quadracus* (Mitchell, 1815): fourspine stickleback, *Pungitius pungitius* (Linnaeus, 1758): ninespine stickleback							
June 10	0.4	-	-	-	-	-	-
June 19	-	-	-	0.0	-	-	-
June 24	0.0	0.9	-	-	0.0	-	-
June 26	71.0	431.0	-	-	-	-	-
July 3	0.0	0.0	-	0.0	-	-	-
July 14	6.3	1.2	0.0	0.0	9.0	-	-
July 29	-	-	-	4.5	0.0	0.0	0.0
PERCICHTHYIDAE (Temperate basses)							
Morone americana (Gmelin, 1788): white perch							
May 29	0.0	0.0	-	-	0.9	-	-
June 19	-	0.0	-	0.0		-	-
June 24	0.0	97.5	-	-	0.0	-	-
June 26	(46.8)	2.1	-	-		-	-
July 3	37.9	15.2	-	20.5		-	-
July 14	0.0	13.1	1.6	0.0	0.0	-	-
PLEURONECTIDAE (Righteye flounders)							
Pleuronectes putnami (Gill, 1864): smooth flounder							
May 29	0.0	0.3	-	-	0.0	-	-

Table 10: Mean abundance (number per 100 m^3 water) of ichthyoplankton taxa in the Richibucto River in summer 1998 by surface salinity and date. Taxa are organized according to phylogeny. Only dates when taxa were collected are shown. A hyphen (-) indicates a salinity range which was not sampled on a particular date.

Taxon & date	Surface salinity (‰)						
	0	0.5-2.0	2.5-4.0	4.5-6.0	6.5-8.0	8.5-10.0	>10.0
CLUPEIDAE (Herrings)							
Alosa spp.: *A. pseudoharengus* (Wilson, 1811) and *A. aestivalis* (Mitchill, 1815): gaspereau							
May 13	352.4	2.5	3.7	0.0	-	-	-
May 15	-	1.7	-	0.0	-	-	-
May 21	0.0	0.0	-	3.3	3.0	-	-
May 27	-	0.0	0.0	-	0.0	-	1.3
May 29	0.0	0.0	1.0	0.0	0.0	-	-
June 4	0.0	5.4	-	-	6.6	4.8	-
June 11	7.5	1.2	0.0	-	1.5	5.5	-
June 16	15.8	10.6	7.2	8.3	5.1	-	0.0
June 18	0.0	68.8	154.0	-	30.7	-	16.8
July 6	149.9	-	0.0	470.5	-	-	50.6
July 21	-	-	-	0.0	-	5.8	11.9
OSMERIDAE (Smelts)							
Osmerus mordax (Mitchell, 1815): rainbow smelt							
May 13	507.6	108.3	371.6	480.2	-	-	-
May 15	-	243.6	-	413.3	-	-	-
May 19	99.7	55.8	445.8	-	5.1	27.9	-
May 21	473.4	149.2	-	532.8	4.5	-	-
May 27	-	112.5	363.1	-	157.5	-	3.8
May 29	28.2	6.4	88.3	9.7	1.3	-	-
June 4	1.1	56.4	-	-	65.3	1.6	-
June 11	7.1	3.6	12.9	-	3.0	1.8	-
June 16	0.0	4.1	0.0	0.0	0.0	-	0.0
June 18	0.0	0.0	6.6	-	0.0	-	0.0
July 6	0.0	-	0.0	0.9	-	-	1.5
July 21	-	-	-	0.0	-	0.0	0.9
CYPRINODONTIDAE (Killifishes)							
Fundulus spp. (*F. diaphanus* (Lesueur, 1817): banded killifish, *F. heteroclitus* (Linnaeus, 1766): mummichog							
July 6	0.0	-	0.0	0.0	-	-	3.0
ATHERINIDAE (Silversides)							
Menidia menidia (Linnaeus, 1766): Atlantic silverside							
June 4	0.0	7.2	-	-	4.9	0.0	-
June 11	0.0	2.4	7.0	-	6.0	0.0	-
June 16	0.0	1.1	1.1	0.0	5.6	-	8.8
June 18	13.2	0.0	5.7	-	4.2	-	2.1
July 6	0.0	-	0.0	0.0	-	-	4.9

Table 10 (con't)

Taxon & date	Surface salinity (‰)						
	0	0.5-2.0	2.5-4.0	4.5-6.0	6.5-8.0	8.5-10.0	>10.0
GASTEROSTEIDAE (Sticklebacks)							
G. aculeatus (Linnaeus, 1758): threespine stickleback, *G.wheatlandi* (Putnam, 1866): blackspotted stipckleback, *Apeltes quadracus* (Mitchell, 1815): fourspine stickleback, *Pungitius pungitius* (Linnaeus, 1758): ninespine stickleback							
May 21	0.0	0.0	-	1.6	0.0	-	-
May 27	-	8.6	0.0	-	0.0	-	2.5
May 29	0.9	6.4	1.0	0.0	2.7	-	-
June 18	10.5	1.4	0.0	-	0.0	-	0.0
PERCICHTHYIDAE (Temperate basses)							
Morone americana (Gmelin, 1788): white perch							
May 27	-	3.3	3.4	-	6.1	-	0.0
June 4	5.7	9.9	-	-	2.1	68.8	-
June 11	26.1	6.0	7.9	-	3.0	0.0	-
June 16	0.0	0.0	1.2	2.4	0.0	-	0.0
June 18	0.0	1.4	18.6	-	4.2	-	0.0
PLEURONECTIDAE (Righteye flounders)							
Pleuronectes putnami (Gill, 1864): smooth flounder							
June 4	1.1	0.0	-	-	0.0	0.0	-

Table 11: Environmental variables measured during the 1997 and 1998 beach seining surveys in the Kouchibouguac and Richibucto Rivers. "N" refers to the numbers of stations sampled during a particular survey.

Year	Date	River	N	Surface Salinity Range (‰)	Surface Temperature Range (°C)	Range Sampled (River km)
1997	July 11	Richibucto	3	2-5	21.0-25.0	8.0-26.5
1997	July 16	Kouchibouguac	6	3-10	17.0-22.0	5.3-11.0
1997	July 18	Richibucto	8	0-13	23.0-26.0	17.8-26.5
1997	July 24	Richibucto	7	3-14	21.0-26.0	17.8-24.2
1997	August 3	Richibucto	8	3-18	17.0-21.0	17.8-26.5
1997	August 4	Richibucto	7	8-23	22.0-24.0	0.0-16.0
1997	August 11	Kouchibouguac	4	5-25	24.0-25.0	-2.6-2.2
1997	August 18	Richibucto	6	0-7	17.0-21.0	26.5-34.5
1997	August 19	Kouchibouguac	2	25-27	17.0-20.0	-2.8-0.0
1997	August 21	Richibucto	7	4-25	19.0-21.0	-17.2 - -9.1
1997	August 26	Kouchibouguac	5	3-n/a	19.5-n/a	1.3-9.8
1997	August 27	Richibucto	4	23-27	21.0-25.0	-11.0-0
1997	August 28	Richibucto	11	3-22	14.0-24.0	-3.0-27.5
1998	June 25	Richibucto	3	1-11	21.5-23.0	16.0-26.5
1998	June 29	Kouchibouguac	2	0-14	17.0-20.0	0.0-13.3
1998	June 30	Kouchibouguac	9	3-25	19.0-21.0	-2.6-10.3
1998	July 2	Richibucto	8	0-8	19.0-21.0	0.0-34.5
1998	July 3	Richibucto	6	0-5	19.0-27.0	19.8-34.5
1998	July 13	Richibucto	5	0-14	17.5-26.0	8.8-34.5
1998	July 14	Richibucto	5	9-23	22.8-25.1	0.0-24.2
1998	July 17	Kouchibouguac	8	4-12	22.0-26.0	0.0-10.3
1998	July 27	Kouchibouguac	6	2-28	20.5-22.0	-1.5-10.3
1998	July 30	Richibucto	5	5-15	22.0-23.0	20.5-34.5
1998	July 31	Richibucto	6	12.5-23	21.0-23.0	0.0-19.8
1998	August 10	Richibucto	6	19-22	26.0-27.0	-3.4-16.0
1998	August 12	Kouchibouguac	1	24	23.0	0.0
1998	August 13	Richibucto	7	25-28	15.0-19.0	-11.0-0.0
1998	August 14	Kouchibouguac	6	0-25	16.0-22.0	-2.6-10.3
1998	August 18	Kouchibouguac	6	3-26	22.0-23.0	-2.6-10.3
1998	August 19	Richibucto	2	31-33	20.0-21.0	-11.0 - -10.7
1998	August 20	Richibucto	5	15-22	22.0-23.0	-3.4-16.0
1998	August 21	Kouchibouguac	4	8-28	17.0-20.0	-2.6-7.6
1998	August 23	Kouchibouguac	2	25-26	18.0-22.0	-2.6-0.0
1998	August 25	Richibucto	5	25-27	18.0-19.0	-10.7-0.0
1998	August 26	Kouchibouguac	5	10-25	18.0-19.0	0.0-7.6
1998	August 27	Richibucto	7	22-28	18.0-20.0	-9.3-3.4
1998	September 9	Kouchibouguac	2	22-25	16.0	0.0-2.2
1998	October 6	Richibucto	7	2-20	8.0-10.0	8.0-27.5

Table 12: Taxa captured in the Kouchibouguac and Richibucto Rivers during 1997 and 1998 beach seining surveys. Relative abundances are presented as abundant (>100 individuals frequently collected in a single sample), common (50 to 100 individuals frequently collected single sample), scarce (5 to 50 individuals typically collected on 2 to 5 occasions), rare (< 5 individuals collected on 2 or less occasions), and absent (no individuals collected).

River and Year			
Kouchibouguac 1997	Kouchibouguac 1998	Richibucto 1997	Richibucto 1998
ANGUILLIDAE			
Anguilla rostrata (Lesueur, 1817): American eel			
Rare	Rare	Absent	Rare
CLUPEIDAE			
Alosa spp. (*A. pseudoharengus* (Wilson, 1811) and *A. aestivalis* (Mitchell, 1815): gaspereau			
Scarce	Scarce	Abundant	Common
OSMERIDAE			
Osmerus mordax (Mitchell, 1815): rainbow smelt			
Absent	Absent	Rare	Scarce
SALMONIDAE			
Salvelinus fontinalis (Mitchill, 1815): brook trout			
Rare	Rare	Absent	Absent
CYPRINIDAE			
Notemigonus crysoleucas (Mitchell, 1814): golden shiner			
Absent	Scarce	Abundant	Abundant
CATOSTOMIDAE			
Catostomus commersoni (Lacépède, 1803): white sucker			
Rare	Absent	Abundant	Common
GADIDAE			
Microgadus tomcod (Walbaum, 1792): Atlantic tomcod			
Rare	Common	Rare	Scarce
CYPRINODONTIDAE			
Fundulus diaphanus (Lesueur, 1817): banded killifish			
Abundant	Abundant	Abundant	Abundant
F. heteroclitus (Linnaeus, 1766): mummichog			
Common	Abundant	Abundant	Abundant

Table 12: (Con't)

River and Year			
Kouchibouguac 1997	Kouchibouguac 1998	Richibucto 1997	Richibucto 1998
ATHERINIDAE			
Menidia menidia (Linnaeus, 1766): Atlantic silverside			
Common	Abundant	Abundant	Abundant
GASTEROSTEIDAE			
Gasterosteus aculeatus (Linnaeus, 1758): threespine stickleback			
Abundant	Abundant	Common	Abundant
G.wheatlandi (Putnam, 1866): blackspotted stickleback			
Scarce	Common	Scarce	Abundant
Apeltes quadracus (Mitchell, 1815): fourspine stickleback			
Abundant	Abundant	Abundant	Abundant
Pungitius pungitius (Linnaeus, 1758): ninespine stickleback			
Common	Abundant	Common	Abundant
PERCICTHYIDAE			
M. americana (Gmelin, 1788): white perch			
Absent	Absent	Abundant	Abundant
Morone saxatilis (Walbaum, 1792): striped bass			
Scarce	Absent	Scarce	Rare
LABRIDAE			
Tautogolabrus adspersus (Walbaum, 1792): cunner			
Absent	Rare	Scarce	Scarce
BOTHIDAE			
Scophthalmus aquosus (Mitchell, 1815): windowpane flounder			
Absent	Rare	Absent	Absent
PLEURONECTIDAE			
Pleuronectes putnami (Gill, 1864): smooth flounder			
Absent	Scarce	Common	Common
Pleuronectes americanus (Walbaum, 1792): winter flounder			
Absent	Scarce	Rare	Common

Table 12: (Con't)

River and Year			
Kouchibouguac 1997	Kouchibouguac 1998	Richibucto 1997	Richibucto 1998
COTTIDAE			
Myoxocephalus scorpius (Linnaeus, 1758): shorthorn sculpin			
Absent	Rare	Rare	Rare

Table 13: Counts of fishes captured by beach seine in Kouchibouguac River in summer 1997. Counts constitute the total number of fishes present in the seine. Taxa are organized according to phylogeny. Only dates when taxa were captured are shown. Species which were present in a given sample but were not enumerated are designated with "P". A hyphen (-) indicates a station which was not sampled on a particular date.

Taxon and date	Station 1	2	3	4	5	6	7	8	9	10	11	12
ANGUILLIDAE												
Anguilla rostrata (Lesueur, 1817): American eel												
August 11	0	-	-	0	0	1	-	-	-	-	-	-
CLUPEIDAE												
Alosa spp. (*A. pseudoharengus* (Wilson, 1811) and *A. aestivalis* (Mitchell, 1815): gaspereau)												
August 11	0	-	-	11	0	0	-	-	-	-	-	-
August 26	-	-	-	-	0	-	1	-	0	0	0	-
SALMONIDAE												
Salvelinus fontinalis (Mitchill, 1815): brook trout												
July 16	-	-	-	-	-	-	0	0	0	0	1	11
CATOSTOMIDAE												
Catostomus commersoni (Lacépède, 1803): white sucker												
July 16	-	-	-	-	-	-	0	0	0	0	0	2
GADIDAE												
Microgadus tomcod (Walbaum, 1792): Atlantic tomcod												
August 26	-	-	-	-	0	-	1	-	0	0	0	-
CYPRINODONTIDAE												
Fundulus diaphanus (Lesueur, 1817): banded killifish												
July 16	-	-	-	-	-	-	25	150	65	29	1	157
August 11	0	-	-	11	8	1	-	-	-	-	-	-
August 26	-	-	-	-	0	-	20	-	2	11	14	-
F. heteroclitus (Linnaeus, 1766): mummichog												
July 16	-	-	-	-	-	-	0	17	2	1	1	0
August 11	0	-	-	6	6	0	-	-	-	-	-	-
August 26	-	-	-	-	1	-	32	-	1	19	0	-
ATHERINIDAE												
Menidia menidia (Linnaeus, 1766): Atlantic silverside												
August 11	126	-	-	28	83	18	-	-	-	-	-	-
August 19	-	P	-	P	-	-	-	-	-	-	-	-
August 26	-	-	-	-	0	-	0	-	6	34	18	-
GASTEROSTEIDAE												
Gasterosteus aculeatus (Linnaeus, 1758): threespine stickleback												
July 16	-	-	-	-	-	-	55	15	56	60	3	44
August 11	0	-	-	13	17	500	-	-	-	-	-	-
August 19	-	P	-	P	-	-	-	-	-	-	-	-
August 26	-	-	-	-	20	-	14	-	62	24	43	-

Table 13: (Con't)

Taxon and date	Station 1	2	3	4	5	6	7	8	9	10	11	12
G.wheatlandi (Putnam, 1866): blackspotted stickleback												
August 11	0	-	-	4	1	10	-	-	-	-	-	-
Apeltes quadracus (Mitchell, 1815): fourspine stickleback												
July 16	-	-	-	-	-	-	0	3	6	6	2	1
August 11	3	-	-	0	17	500	-	-	-	-	-	-
August 19	-	P	-	P	-	-	-	-	-	-	-	-
August 26	-	-	-	-	32	-	15	-	0	2	3	-
Pungitius pungitius (Linnaeus, 1758): ninespine stickleback												
July 16	-	-	-	-	-	-	1	4	0	0	0	0
August 11	0	-	-	5	0	9	-	-	-	-	-	-
August 19	-	P	-	P	-	-	-	-	-	-	-	-
August 26	-	-	-	-	0	-	10	-	11	19	5	-
PERCICTHYIDAE												
Morone saxatilis (Walbaum, 1792): striped bass												
August 19	-	3	-	59	-	-	-	-	-	-	-	-

Table 14: Counts of fishes captured by beach seine in Kouchibouguac River in summer 1998. Counts constitute the total number of fishes present in the seine. Taxa are organized according to phylogeny. Only dates when taxa were captured are shown. Species which were present in a given sample but were not enumerated are designated with "P". A hyphen (-) indicates a station which was not sampled on a particular date.

Taxon and date	Station 1	2	3	4	5	6	7	8	9	10	11	12	13	14
ANGUILLIDAE														
Anguilla rostrata (Lesueur, 1817): American eel														
June 30	0	-	-	0	0	1	2	0	0	0	0	-	-	-
July 17	-	-	-	0	0	0	0	0	0	1	0	-	-	-
CLUPEIDAE														
Alosa spp. (*A. pseudoharengus* (Wilson, 1811) and *A. aestivalis* (Mitchell, 1815): gaspereau)														
August 18	0	-	-	0	0	-	8	-	25	-	0	-	-	-
SALMONIDAE														
Salvelinus fontinalis (Mitchill, 1815): brook trout														
June 29	-	-	-	0	-	-	-	-	-	-	-	-	-	14
CYPRINIDAE														
Notemigonus crysoleucas (Mitchell, 1814): golden shiner														
June 29	-	-	-	3	-	-	-	-	-	-	-	-	-	50
GADIDAE														
Microgadus tomcod (Walbaum, 1792): Atlantic tomcod														
June 30	0	-	-	0	1	0	0	0	0	0	0	-	-	-
August 14	0	-	-	14	1	-	0	-	0	-	0	-	-	-
August 18	12	-	-	0	12	-	0	-	0	-	0	-	-	-
August 21	1	-	-	1	0	-	-	-	0	-	-	-	-	-
August 23	5	-	-	17	-	-	-	-	-	-	-	-	-	-
August 26	-	-	-	3	2	-	0	-	5	-	-	-	-	-
CYPRINODONTIDAE														
Fundulus spp. (*Fundulus diaphanus* (Lesueur, 1817): banded killifish and *F. heteroclitus* (Linnaeus, 1766): mummichog)														
June 29	-	-	-	4	-	-	-	-	-	-	-	-	-	0
June 30	0	-	-	15	29	189	128	11	83	500	14	-	-	-
July 17	-	-	-	7	9	10	24	9	62	99	5	-	-	-
July 27	-	-	4	12	150	-	4	-	10	-	6	-	-	-
August 12	-	-	-	1	-	-	-	-	-	-	-	-	-	-
August 14	0	-	-	101	7	-	34	-	260	-	0	-	-	-
August 18	0	-	-	500	20	-	26	-	444	-	1	-	-	-
August 21	0	-	-	375	25	-	-	-	150	-	-	-	-	-
August 23	0	-	-	500	-	-	-	-	-	-	-	-	-	-
August 26	-	-	-	33	25	-	60	-	300	-	-	-	-	-
ATHERINIDAE														
Menidia menidia (Linnaeus, 1766): Atlantic silverside														
June 30	3	-	-	10	51	0	0	50	0	0	0	-	-	-
July 27	-	-	47	0	0	-	7	-	13	-	1	-	-	-
August 12	-	-	-	50	-	-	-	-	-	-	-	-	-	-

Table 14: (Con't)

Taxon and date	Station 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Menidia menidia (Linnaeus, 1766): Atlantic silverside (Con't)														
August 14	100	-	-	500	0	-	0	-	3	-	1	-	-	-
August 18	300	-	-	17	1	-	5	-	15	-	0	-	-	-
August 21	275	-	-	295	40	-	-	-	73	-	-	-	-	-
August 23	500	-	-	500	-	-	-	-	-	-	-	-	-	-
August 26	-	-	-	80	60	-	25	-	0	-	-	-	-	-
September 9	-	-	-	1	0	-	-	-	-	-	-	-	-	-
GASTEROSTEIDAE														
Gasterosteus aculeatus (Linnaeus, 1758): threespine stickleback														
June 29	-	-	-	50	-	-	-	-	-	-	-	-	-	38
June 30	80	-	-	227	272	500	2	17	295	363	190	-	-	-
July 17	-	-	-	99	35	36	91	107	125	349	276	-	-	-
July 27	-	-	86	120	16	-	116	-	242	-	500	-	-	-
August 14	70	-	-	500	50	-	13	-	20	-	20	-	-	-
August 18	50	-	-	500	18	-	28	-	113	-	15	-	-	-
August 21	43	-	-	220	25	-	-	-	87	-	-	-	-	-
August 23	0	-	-	55	-	-	-	-	-	-	-	-	-	-
August 26	-	-	-	40	30	-	30	-	25	-	-	-	-	-
September 9	-	-	-	8	12	-	-	-	-	-	-	-	-	-
G.wheatlandi (Putnam, 1866): blackspotted stickleback														
June 30	2	-	-	0	4	23	0	0	6	4	0	-	-	-
July 17	-	-	-	63	16	10	1	79	11	8	0	-	-	-
July 27	-	-	7	0	0	-	5	-	12	-	0	-	-	-
August 14	0	-	-	29	0	-	5	-	0	-	0	-	-	-
August 18	0	-	-	29	4	-	0	-	8	-	0	-	-	-
August 21	20	-	-	12	0	-	-	-	100	-	-	-	-	-
August 23	0	-	-	7	-	-	-	-	-	-	-	-	-	-
August 26	-	-	-	33	30	-	10	-	25	-	-	-	-	-
Apeltes quadracus (Mitchell, 1815): fourspine stickleback														
June 29	-	-	-	0	-	-	-	-	-	-	-	-	-	5
June 30	12	-	-	74	88	0	204	3	1	5	0	-	-	-
July 17	-	-	-	0	3	21	10	26	0	4	0	-	-	-
July 27	-	-	11	125	8	-	1	-	0	-	0	-	-	-
August 14	0	-	-	140	50	-	25	-	0	-	1	-	-	-
August 18	6	-	-	31	42	-	3	-	2	-	0	-	-	-
August 21	10	-	-	84	60	-	-	-	50	-	-	-	-	-
August 23	0	-	-	20	-	-	-	-	-	-	-	-	-	-
August 26	-	-	-	50	35	-	20	-	25	-	-	-	-	-
Pungitius pungitius (Linnaeus, 1758): ninespine stickleback														
June 29	-	-	-	5	-	-	-	-	-	-	-	-	-	1
June 30	0	-	-	0	2	9	1	1	0	0	0	-	-	-
July 17	-	-	-	20	2	4	0	18	16	277	51	-	-	-
July 27	-	-	0	0	1	-	11	-	26	-	1	-	-	-
August 12	-	-	-	2	-	-	-	-	-	-	-	-	-	-
August 14	0	-	-	0	0	-	0	-	3	-	25	-	-	-

Table 14 (Con't)

Taxon and date	Station 1	2	3	4	5	6	7	8	9	10	11	12	13	14
Pungitius pungitius (Linnaeus, 1758): ninespine stickleback (Con't)														
August 18	0	-	-	30	0	-	27	-	16	-	0	-	-	-
August 21	1	-	-	40	0	-	-	-	12	-	-	-	-	-
August 26	-	-	-	22	0	-	10	-	25	-	-	-	-	-
LABRIDAE														
Tautogolabrus adspersus (Walbaum, 1792): cunner														
August 18	0	-	-	1	0	-	0	-	0	-	0	-	-	
August 23	2	-	-	0	-	-	-	-	-	-	-	-	-	-
BOTHIDAE														
Scophthalmus aquosus (Mitchell, 1815): windowpane flounder														
August 14	1	-	-	0	0	-	0	-	0	-	0	-	-	-
August 23	3	-	-	0	-	-	-	-	-	-	-	-	-	-
PLEURONECTIDAE														
Pleuronectes putnami (Gill, 1864): smooth flounder														
June 30	0	-	-	0	0	0	0	0	1	1	0	-	-	-
August 14	0	-	-	2	0	-	0	-	0	-	0	-	-	-
August 18	0	-	-	0	0	-	0	-	2	-	0	-	-	-
August 23	0	-	-	5	-	-	-	-	-	-	-	-	-	-
August 26	-	-	-	5	0	-	0	-	1	-	-	-	-	-
Pleuronectes americanus (Walbaum, 1792): winter flounder														
June 30	2	-	-	1	0	0	0	0	0	0	0	-	-	-
July 17	-	-	-	0	0	0	11	1	0	0	0	-	-	-
July 27	-	-	11	0	0	-	0	-	0	-	0	-	-	-
August 14	0	-	-	1	0	-	0	-	1	-	0	-	-	-
August 18	0	-	-	3	0	-	0	-	0	-	0	-	-	-
COTTIDAE														
Myoxocephalus scorpius (Linnaeus, 1758): shorthorn sculpin														
June 30	3	-	-	0	0	0	0	0	0	0	0	-	-	-

Table 15: Counts of fishes captured by beach seine in Richibucto River in summer 1997. Counts constitute the total number of fishes present in the seine. Taxa are organized according to phylogeny. Species which were present in a given sample but were not enumerated are designated with "P". A hyphen (-) indicates a station which was not sampled on a particular date.

Taxon and	Station (Number of hauls if N >1)																													
date	1	3	4	5	6	7	8	9	10	14	16	17	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
CLUPEIDAE																															
Alosa spp. (*A. pseudoharengus* (Wilson, 1811) and *A. aestivalis* (Mitchell, 1815): gaspereau)																															
July 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-
July 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	500	1	17	0	0	0	0	0	-	-	-	-	-
July 24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	7	41	14	3	200	0	-	-	-	-	-	-
August 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1	150	6	1	0	0	-	-	-	-	-
August 4	-	-	-	-	-	-	-	-	-	-	-	153	10	15	7	180	13	500	-	-	-	-	-	-	-	-	-	-	-	-	-
August 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P	0	0	0	0
August 21	-	0	0	-	P	0	0	0	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	2	-	-	P	-	-	-	-	-	0	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 28	-	-	-	-	-	-	-	-	-	-	P	-	0	P	-	-	P	P	0	-	-	P	P	-	0	0	0	-	-	-	-
OSMERIDAE																															
Osmerus mordax (Mitchell, 1815): rainbow smelt																															
August 28	-	-	-	-	-	-	-	-	-	-	P	-	0	0	-	-	0	0	0	-	-	0	0	-	0	0	0	-	-	-	-
CYPRINIDAE																															
Notemigonus crysoleucas (Mitchell, 1814): golden shiner																															
July 24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1	0	2	200	31	-	-	-	-	-	-
August 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	2	475	0	0	-	-	-	-	-
August 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	0	0	P	P	P
CATOSTOMIDAE																															
Catostomus commersoni (Lacépède, 1803): white sucker																															
July 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	2	500	0	4	-	-	-	-	-
July 24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	200	0	-	-	-	-	-	-
August 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	4	0	0	-	-	-	-	-
August 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	0	P	P	P	P
August 21	-	0	0	-	0	0	P	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
GADIDAE																															
Microgadus tomcod (Walbaum, 1792): Atlantic tomcod																															
August 4	-	-	-	-	-	-	-	-	-	-	-	1	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 15: (Con't)

Taxon and date	Station (Number of hauls if N >1)																													
	1	3	4	5	6	7	8	9	10	14	16	17	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
CYPRINODONTIDAE																															
Fundulus diaphanus (Lesueur, 1817): banded killifish																															
July 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	0	-	-	-	-	-	-	500	-	-	-	-	-
July 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	59	49	4	203	1	13	25	-	-	-	-	-
July 24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	149	7	12	87	12	10	-	-	-	-	-	-
August 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	49	46	2	35	0	12	1	-	-	-	-	-
August 4	-	-	-	-	-	-	-	-	-	-	-	15	2	23	36	65	58	3	-	-	-	-	-	-	-	-	-	-	-	-	-
August 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P	P	P	P	P
August 21	-	0	0	-	P	P	P	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 28	-	-	-	-	-	-	-	-	-	-	P	-	0	P	-	-	10	P	P	-	-	P	P	-	P	0	0	-	-	-	-
F. heteroclitus (Linnaeus, 1766): mummichog																															
July 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	0	-	-	-	-	-	-	500	-	-	-	-	-
July 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	16	7	3	7	0	0	0	-	-	-	-	-
July 24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	90	1	0	6	0	2	-	-	-	-	-	-
August 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	2	0	0	0	-	-	-	-	-
August 4	-	-	-	-	-	-	-	-	-	-	-	5	3	17	19	12	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-
August 21	-	0	0	-	P	P	P	P	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 28	-	-	-	-	-	-	-	-	-	-	0	-	0	0	-	-	14	0	0	-	-	P	0	-	0	0	0	-	-	-	-
ATHERINIDAE																															
Menidia menidia (Linnaeus, 1766): Atlantic silverside																															
July 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	4	-	-	-	-	-	-	0	-	-	-	-	-
July 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	3	0	0	1	5	-	-	-	-	-
July 24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	319	500	19	52	6	10	9	-	-	-	-	-	-
August 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	52	202	12	69	36	1	7	11	-	-	-	-	-
August 4	-	-	-	-	-	-	-	-	-	-	-	500	148	90	500	500	298	500	-	-	-	-	-	-	-	-	-	-	-	-	-
August 21	-	0	P	-	P	P	P	P	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	500	-	-	P	-	-	-	-	-	P	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 28	-	-	-	-	-	-	-	-	-	-	P	-	P	P	-	-	40	P	0	-	-	P	0	-	P	0	P	-	-	-	-
GASTEROSTEIDAE																															
Gasterosteus aculeatus (Linnaeus, 1758): threespine stickleback																															
July 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-
July 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	0	3	0	2	6	0	0	-	-	-	-	-
July 24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	1	0	2	2	0	-	-	-	-	-	-

Table 15: (Con't)

Taxon and date	Station (Number of hauls if N >1)																													
	1	3	4	5	6	7	8	9	10	14	16	17	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
Gasterosteus aculeatus (Linnaeus, 1758): threespine stickleback (Con't)																															
August 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	2	3	0	0	0	-	-	-	-	-
August 4	-	-	-	-	-	-	-	-	-	-	-	6	5	15	5	17	1	4	-	-	-	-	-	-	-	-	-	-	-	-	-
August 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	P	0	P
August 21	-	0	0	-	0	0	0	P	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	P	-	-	P	-	-	-	-	-	0	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 28	-	-	-	-	-	-	-	-	-	-	P	-	P	0	-	-	P	P	0	-	-	0	0	-	0	0	P	-	-	-	-
G.wheatlandi (Putnam, 1866): blackspotted stickleback																															
July 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-
July 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	2	0	0	0	2	0	-	-	-	-	-
July 24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	0	2	0	-	-	-	-	-	-
August 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	0	0	0	0	0	0	-	-	-	-	-
August 4	-	-	-	-	-	-	-	-	-	-	-	0	0	2	1	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-
Apeltes quadracus (Mitchell, 1815): fourspine stickleback																															
July 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	4	-	-	-	-	-	-	P	-	-	-	-	-
July 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	3	48	0	10	7	3	500	-	-	-	-	-
July 24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	4	0	53	0	2	-	-	-	-	-	-
August 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	1	1	23	0	1	0	-	-	-	-	-
August 4	-	-	-	-	-	-	-	-	-	-	-	154	13	17	42	17	0	6	-	-	-	-	-	-	-	-	-	-	-	-	-
August 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P	0	P	P	P
August 21	-	0	0	-	P	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	0	-	-	P	-	-	-	-	-	P	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 28	-	-	-	-	-	-	-	-	-	-	P	-	P	P	-	-	P	P	P	-	-	0	P	-	P	0	0	-	-	-	-
Pungitius pungitius (Linnaeus, 1758): ninespine stickleback																															
July 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	-	-	-	0	-	-	-	-	-	-	P	-	-	-	-	-
July 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	7	20	0	13	5	0	6	-	-	-	-	-
July 24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	14	0	0	11	0	0	-	-	-	-	-	-
August 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	3	1	1	77	2	2	1	-	-	-	-	-
August 4	-	-	-	-	-	-	-	-	-	-	-	66	2	40	24	6	0	3	-	-	-	-	-	-	-	-	-	-	-	-	-
August 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	0	0	0	P	P
August 21	-	0	0	-	P	0	P	P	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	0	-	-	0	-	-	-	-	-	0	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 28	-	-	-	-	-	-	-	-	-	-	P	-	P	0	-	-	P	P	0	-	-	0	P	-	0	0	0	-	-	-	-

Table 15: (Con't)

Taxon and date	Station (Number of hauls if N >1) 1	3	4	5	6	7	8	9	10	14	16	17	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
PERCICTHYIDAE																															
M. americana (Gmelin, 1788): white perch																															
July 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	0	-	-	-	-	-	-	1	-	-	-	-	-
July 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	554	0	84	111	0	0	500	-	-	-	-	-
August 4	-	-	-	-	-	-	-	-	-	-	-	0	0	0	0	500	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-
August 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	P	P	P	P	P	P
August 21	-	0	0	-	0	0	P	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	0	-	-	0	-	-	-	-	-	7	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 28	-	-	-	-	-	-	-	-	-	-	0	-	1	0	-	-	60	44	500	-	-	22	6	-	53	20	52	-	-	-	-
Morone saxatilis (Walbaum, 1792): striped bass																															
August 21	-	0	1	-	5	9	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	0	-	-	1	-	-	-	-	-	1	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 28	-	-	-	-	-	-	-	-	-	-	0	-	0	1	-	-	1	3	7	-	-	0	0	-	0	0	0	-	-	-	-
LABRIDAE																															
Tautogolabrus adspersus (Walbaum, 1792): cunner																															
August 4	-	-	-	-	-	-	-	-	-	-	-	1	0	0	0	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	0	-	-	0	-	-	-	-	-	0	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 28	-	-	-	-	-	-	-	-	-	-	P	-	0	0	-	-	0	0	0	-	-	0	0	-	0	0	0	-	-	-	-
PLEURONECTIDAE																															
Pleuronectes putnami (Gill, 1864): smooth flounder																															
July 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	P	-	-	-	-	-	-	P	-	-	-	-	-
July 18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	2	0	20	0	0	6	0	-	-	-	-	-
July 24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	1	1	0	3	-	-	-	-	-	-
August 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	0	2	1	0	1	1	-	-	-	-	-
August 4	-	-	-	-	-	-	-	-	-	-	-	12	7	0	10	0	5	0	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	0	-	-	0	-	-	-	-	-	P	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 28	-	-	-	-	-	-	-	-	-	-	P	-	0	0	-	-	13	P	P	-	-	P	0	-	P	0	0	-	-	-	-
Pleuronectes americanus (Walbaum, 1792): winter flounder																															
August 27	0	-	-	0	-	-	-	-	-	0	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 28	-	-	-	-	-	-	-	-	-	-	0	-	P	0	-	-	0	0	0	-	-	0	0	-	0	0	0	-	-	-	-

Table 15: (Con't)

Taxon and date	Station (Number of hauls if N >1)																														
	1	3	4	5	6	7	8	9	10	14	16	17	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37
COTTIDAE																															
Myoxocephalus scorpius (Linnaeus, 1758): shorthorn sculpin																															
August 27	0	-	-	P	-	-	-	-	-	P	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 28	-	-	-	-	-	-	-	-	-	-	P	-	0	0	-	-	0	0	0	-	-	0	0	-	0	0	0	-	-	-	-

Table 16: Counts of fishes captured by beach seine in Richibucto River in summer 1998. Counts constitute the total number of fishes present in the seine. Taxa are organized according to phylogeny. Species which were present in a given sample but were not enumerated are designated with "P". A hyphen (-) indicates a station which was not sampled on a particular date.

Taxon and date	Station 1	2	5	6	10	11	12	13	14	15	17	18	19	20	21	23	24	25	26	27	28	29	30	31	32	33	37
ANGUILLIDAE																											
Anguilla rostrata (Lesueur, 1817): American eel																											
July 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	0	1	0
CLUPEIDAE																											
Alosa spp. (*A. pseudoharengus* (Wilson, 1811) and *A. aestivalis* (Mitchell, 1815): gaspereau)																											
July 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	-	0	0	0
July 14	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	0	0	8	4	-	-	-	-	-	-	-
July 30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	115	0	-	-	0	0	4
July 31	-	-	-	-	-	-	-	-	-	-	127	0	-	0	-	0	21	-	52	-	-	-	-	-	-	-	-
August 10	-	-	-	-	-	-	-	-	0	-	0	0	-	0	-	7	-	-	-	-	-	-	-	-	-	-	-
August 19	0	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 25	-	0	0	0	-	-	-	-	2	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October 6	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	1	0	0	-	-	0	-	-	-	1	0	-
OSMERIDAE																											
Osmerus mordax (Mitchell, 1815): rainbow smelt																											
June 25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	4	-	-	-	-	-	-	0	-	-
July 2	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	2	1	-	-	24	-	0	1	0		0
October 6	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	0	1	-	-	1	-	-	-	1	0	-
CYPRINIDAE																											
Notemigonus crysoleucas (Mitchell, 1814): golden shiner																											
June 25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	244	-	-
July 2	-	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	0	0	-	-	0	-	0	0	79		0
July 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	0	31	-	-	0	-	-	32	1
July 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	6	-	212	53	16
July 30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	25	-	-	19	0	0
October 6	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	0	0	-	-	1	-	-	-	1	0	-

Table 16: (Con't)

Taxon and date	Station 1	2	5	6	11	12	13	14	15	17	18	19	20	21	23	24	25	26	27	28	29	30	31	32	33	37
CATOSTOMIDAE																										
Catostomus commersoni (Lacépède, 1803): white sucker																										
July 2	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	0	0	-	-	0	-	0	0	69		0
July 3	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	0	0	-	-	0	-	-	95	0
July 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	250	1	0
GADIDAE																										
Microgadus tomcod (Walbaum, 1792): Atlantic tomcod																										
August 19	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 20	-	-	-	-	-	-	-	1	-	0	-	-	0	-	1	0	-	-	-	-	-	-	-	-	-	-
August 25	-	0	0	1	-	-	-	0	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	-	-	-	0	-	25	0	2	0	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October 6	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	0	0	-	-	0	-	-	-	2	0	-
CYPRINODONTIDAE																										
Fundulus spp. (Fundulus diaphanus (Lesueur, 1817): banded killifish and *F. heteroclitus* (Linnaeus, 1766): mummichog)																										
June 25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	7	-	-	-	-	-	-	500	-	-
July 2	-	-	-	-	-	-	-	-	-	5	-	-	-	-	-	7	84	-	-	3	-	53	33	304	-	10
July 3	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	214	500	-	-	500	-	-	96	4
July 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	18	-	84	70	2
July 14	-	-	-	-	-	-	-	-	-	104	-	-	-	-	-	91	12	0	5	-	-	-	-	-	-	-
July 30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	-	-	36	44	0
July 31	-	-	-	-	-	-	-	-	-	7	0	-	3	-	1	156	-	287	-	-	-	-	-	-	-	-
August 10	-	-	-	-	-	-	-	26	-	20	28	-	26	-	66	-	-	-	-	-	-	-	-	-	-	-
August 13	0	0	1	-	10	-	-	13	1	28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 20	-	-	-	-	-	-	-	50	-	20	-	-	50	-	25	300	-	-	-	-	-	-	-	-	-	-
August 25	-	0	500	55	-	-	-	343	-	46	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	-	-	-	500	-	500	0	48	36	-	24	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October 6	-	-	-	-	-	-	-	-	-	-	-	-	1	-	0	0	0	-	-	1	-	-	-	13	3	-

Table 16: (Con't)

Taxon and date	Station 1	2	5	6	11	12	13	14	15	17	18	19	20	21	23	24	25	26	27	28	29	30	31	32	33	37
ATHERINIDAE																										
Menidia menidia (Linnaeus, 1766): Atlantic silverside																										
June 25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12	2	-	-	-	-	-	-	0	-	-
July 2	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	15	0	-	-	0	-	0	1	0		0
July 3	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	2	0	-	-	0	-	-	0	0
July 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	0	-	0	0	0
July 14	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	100	152	183	3	-	-	-	-	-	-	-
July 30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	182	0	-	-	74	45	5
July 31	-	-	-	-	-	-	-	-	-	119	45	-	0	-	33	90	-	0	-	-	-	-	-	-	-	-
August 10	-	-	-	-	-	-	-	300	-	0	278	-	58	-	111	-	-	-	-	-	-	-	-	-	-	-
August 13	100	500	32	-	64	-	-	52	50	124	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 19	75	500	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 20	-	-	-	-	-	-	-	200	-	70	-	-	50	-	30	60	-	-	-	-	-	-	-	-	-	-
August 25	-	500	500	250	-	-	-	85	-	200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	-	-	-	500	-	70	121	0	50	-	23	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October 6	-	-	-	-	-	-	-	-	-	-	-	-	30	-	30	0	50	-	-	18	-	-	-	0	0	-
GASTEROSTEIDAE																										
Gasterosteus aculeatus (Linnaeus, 1758): threespine stickleback																										
June 25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	9	-	-	-	-	-	-	3	-	-
July 2	-	-	-	-	-	-	-	-	-	8	-	-	-	-	-	6	2	-	-	2	-	3	7	67		18
July 3	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	0	0	-	-	0	-	-	3	100
July 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	0	-	0	0	1
July 30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	0	-	-	0	23	0
July 31	-	-	-	-	-	-	-	-	-	20	0	-	1	-	0	6	-	4	-	-	-	-	-	-	-	-
August 10	-	-	-	-	-	-	-	0	-	12	500	-	12	-	0	-	-	-	-	-	-	-	-	-	-	-
August 13	0	0	1	-	27	-	-	1	500	64	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 20	-	-	-	-	-	-	-	0	-	25	-	-	20	-	0	0	-	-	-	-	-	-	-	-	-	-
August 25	-	0	0	80	-	-	-	7	-	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	-	-	-	500	-	500	0	15	37	-	5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October 6	-	-	-	-	-	-	-	-	-	-	-	-	P	-	15	0	0	-	-	0	-	-	-	8	0	-
G.wheatlandi (Putnam, 1866): blackspotted stickleback																										
July 2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	0	-	-	0	-	1	0	0	-	0

Table 16: (Con't)

Taxon and date	Station 1	2	5	6	11	12	13	14	15	17	18	19	20	21	23	24	25	26	27	28	29	30	31	32	33	37
G.wheatlandi (Putnam, 1866): blackspotted stickleback (Con't)																										
July 3	-	-	-	-	-	-	-	-	-	-	-	-	-	5	-	-	-	0	0	-	-	3	-	-	0	0
July 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	0	4	0
July 14	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	1	1	0	1	-	-	-	-	-	-	-
July 30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	0	3	3
July 31	-	-	-	-	-	-	-	-	-	3	0	-	0	-	0	0	-	0	-	-	-	-	-	-	-	-
August 13	1	3	0	-	0	-	-	0	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 20	-	-	-	-	-	-	-	0	-	25	-	-	20	-	0	0	-	-	-	-	-	-	-	-	-	-
August 25	-	0	0	0	-	-	-	3	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	-	-	-	500	-	500	0	10	37	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October 6	-	-	-	-	-	-	-	-	-	-	-	-	P	-	15	0	0	-	-	0	-	-	-	500	0	-
Apeltes quadracus (Mitchell, 1815): fourspine stickleback																										
June 25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	1	-	-	-	-	-	-	0	-	-
July 2	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	0	0	-	-	0	-	0	0	2		1
July 3	-	-	-	-	-	-	-	-	-	-	-	-	-	3	-	-	-	0	0	-	-	50	-	-	46	102
July 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	1	-	0	4	0
July 14	-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	0	0	0	0	-	-	-	-	-	-	-
July 30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	500	-	-	0	4	3
July 31	-	-	-	-	-	-	-	-	-	110	0	-	4	-	0	24	-	0	-	-	-	-	-	-	-	-
August 10	-	-	-	-	-	-	-	2	-	25	0	-	8	-	8	-	-	-	-	-	-	-	-	-	-	-
August 13	0	0	0	-	45	-	-	57	1	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 20	-	-	-	-	-	-	-	10	-	25	-	-	20	-	0	5	-	-	-	-	-	-	-	-	-	-
August 25	-	0	0	132	-	-	-	108	-	55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	-	-	-	500	-	500	0	57	37	-	5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October 6	-	-	-	-	-	-	-	-	-	-	-	-	P	-	15	0	0	-	-	0	-	-	-	3	2	-
Pungitius pungitius (Linnaeus, 1758): ninespine stickleback																										
June 25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11	1	-	-	-	-	-	-	1	-	-
July 2	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	0	0	-	-	0	-	0	0	1		6
July 3	-	-	-	-	-	-	-	-	-	-	-	-	-	11	-	-	-	0	1	-	-	0	-	-	8	114
July 14	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	0	2	0	0	-	-	-	-	-	-	-
July 30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	0	9	0
July 31	-	-	-	-	-	-	-	-	-	0	0	-	4	-	0	0	-	0	-	-	-	-	-	-	-	-
August 10	-	-	-	-	-	-	-	0	-	0	0	-	0	-	10	-	-	-	-	-	-	-	-	-	-	-

Table 16: (Con't)

Taxon and date	Station 1	2	5	6	11	12	13	14	15	17	18	19	20	21	23	24	25	26	27	28	29	30	31	32	33	37
Pungitius pungitius (Linnaeus, 1758): ninespine stickleback (Con't)																										
August 13	0	0	0	-	5	-	-	1	500	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 20	-	-	-	-	-	-	-	0	-	25	-	-	0	-	0	0	-	-	-	-	-	-	-	-	-	-
August 25	-	0	0	0	-	-	-	0	-	P	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	-	-	-	500	-	0	0	0	37	-	5	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October 6	-	-	-	-	-	-	-	-	-	-	-	-	P	-	15	0	0	-	-	0	-	-	-	500	2	-
PERCICTHYIDAE																										
M. americana (Gmelin, 1788): white perch																										
June 25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	0	-	-	-	-	-	-	8	-	-
July 2	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	0	0	-	-	1	-	0	0	3		0
July 3	-	-	-	-	-	-	-	-	-	-	-	-	-	0	-	-	-	0	0	-	-	9	-	-	P	0
July 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0	2	-	500	32	0
July 30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	53	1	-	-	14	59	0
July 31	-	-	-	-	-	-	-	-	-	0	23	-	29	-	6	14	-	56	-	-	-	-	-	-	-	-
August 10	-	-	-	-	-	-	-	0	-	0	0	-	5	-	5	-	-	-	-	-	-	-	-	-	-	-
August 13	0	0	0	-	0	-	-	15	1	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 20	-	-	-	-	-	-	-	0	-	0	-	-	0	-	1	0	-	-	-	-	-	-	-	-	-	-
August 25	-	0	0	0	-	-	-	15	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	-	-	-	0	-	0	0	3	0	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October 6	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	0	0	-	-	38	-	-	-	22	0	-
Morone saxatilis (Walbaum, 1792): striped bass																										
August 25	-	0	12	1	-	-	-	7	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	-	-	-	0	-	0	0	0	0	-	0	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LABRIDAE																										
Tautogolabrus adspersus (Walbaum, 1792): cunner																										
August 10	-	-	-	-	-	-	-	0	-	0	0	-	2	-	0	-	-	-	-	-	-	-	-	-	-	-
August 25	-	0	0	0	-	-	-	0	-	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	-	-	-	0	-	3	0	0	0	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 16: (Con't)

Taxon and date	Station 1	2	5	6	11	12	13	14	15	17	18	19	20	21	23	24	25	26	27	28	29	30	31	32	33	37
PLEURONECTIDAE																										
Pleuronectes putnami (Gill, 1864): smooth flounder																										
June 25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	14	-	-	-	-	-	-	0	-	-
July 3	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	0	0	-	-	0	-	-	0	0
July 30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5	0	-	-	1	0	0
July 31	-	-	-	-	-	-	-	-	-	1	2	-	0	-	1	9	-	2	-	-	-	-	-	-	-	-
August 10	-	-	-	-	-	-	-	0	-	2	0	-	1	-	11	-	-	-	-	-	-	-	-	-	-	-
August 13	0	0	0	-	6	-	-	0	0	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 20	-	-	-	-	-	-	-	1	-	1	-	-	9	-	11	1	-	-	-	-	-	-	-	-	-	-
August 25	-	0	0	0	-	-	-	9	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	-	-	-	33	-	4	0	5	3	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October 6	-	-	-	-	-	-	-	-	-	-	-	-	0	-	0	0	0	-	-	8	-	-	-	1	0	-
Pleuronectes americanus (Walbaum, 1792): winter flounder																										
July 2	-	-	-	-	-	-	-	-	-	0	-	-	-	-	-	5	15	-	-	4	-	0	1	0		0
July 13	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	0	-	0	0	0
July 14	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	9	12	0	27	-	-	-	-	-	-	-
August 10	-	-	-	-	-	-	-	0	-	1	1	-	2	-	1	-	-	-	-	-	-	-	-	-	-	-
August 20	-	-	-	-	-	-	-	1	-	1	-	-	3	-	0	0	-	-	-	-	-	-	-	-	-	-
August 25	-	0	51	4	-	-	-	3	-	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
August 27	-	-	-	0	-	8	0	3	0	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-
October 6	-	-	-	-	-	-	-	-	-	-	-	-	1	-	4	0	0	-	-	0	-	-	-	2	0	-
COTTIDAE																										
Myoxocephalus scorpius (Linnaeus, 1758): shorthorn sculpin																										
August 27	-	-	-	0	-	15	0	0	0	-	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 17: Counts of fishes captured by an array of four fyke nets in the Kouchibouguac Lagoon in late August 1997. Counts constitute the total number of fishes present in a linear array of four fyke nets. Taxa are organized according to phylogeny. A hyphen (-) indicates a taxon which were not enumerate on a particular sampling day (i.e. August 21).

Sampling Date (Summer 1997)				
August 20	August 21	August 22	August 27	August 29
ANGUILLIDAE				
Anguilla rostrata (Lesueur, 1817): American eel				
0	-	0	10	9
GADIDAE				
Microgadus tomcod (Walbaum, 1792): Atlantic tomcod				
0	-	36	150	135
CYPRINODONTIDAE				
Fundulus diaphanus (Lesueur, 1817): banded killifish				
0	-	0	0	51
F. heteroclitus (Linnaeus, 1766): mummichog				
0	-	66	0	0
ATHERINIDAE				
Menidia menidia (Linnaeus, 1766): Atlantic silverside				
0	-	19	0	0
GASTEROSTEIDAE				
Gasterosteus aculeatus (Linnaeus, 1758): threespine stickleback				
0	-	83	9	12
Apeltes quadracus (Mitchell, 1815): fourspine stickleback				
0	-	0	0	12
Pungitius pungitius (Linnaeus, 1758): ninespine stickleback				
0	-	0	0	4
PERCICTHYIDAE				
Morone saxatilis (Walbaum, 1792): striped bass				
19	37	2	2	0
PLEURONECTIDAE				
Pleuronectes putnami (Gill, 1864): smooth flounder				
0	-	5	1	1
Pleuronectes americanus (Walbaum, 1792): winter flounder				
0	-	0	1	9
COTTIDAE				
Myoxocephalus scorpius (Linnaeus, 1758): shorthorn sculpin				
0	-	0	1	0

Table 18: Capture dates, locations, numbers (N), mean lengths, and length ranges of all YOY striped bass captured in beach seine surveys and fyke net arrays in 1997 and 1998 in the Kouchibouguac and Richibucto Estuaries.

Year	Date	River	Station	N	Total length (mm)			
					Mean	Range	Min	Max
1997	0819	Kouchibouguac	2	3	71.5	6.5	68.0	74.5
1997	0819	Kouchibouguac	4	59	68.5	16.5	59.5	76.0
1997	0820	Kouchibouguac	Fyke Net	19	70.3	16.0	61.5	77.5
1997	0821	Richibucto	4	1	66.5	0.0	66.5	66.5
1997	0821	Richibucto	6	5	75.1	17.5	67.5	85.0
1997	0821	Richibucto	7	9	71.6	15.5	64.5	80.0
1997	0821	Kouchibouguac	Fyke Net	37	71.3	27.0	61.0	88.0
1997	0822	Kouchibouguac	Fyke Net	2	73.0	5.0	70.5	75.5
1997	0827	Kouchibouguac	Fyke Net	2	69.7	21.5	59.0	80.5
1997	0827	Richibucto	5	1	76.0	0.0	76.0	76.0
1997	0827	Richibucto	14	1	75.5	0.0	75.5	75.5
1997	0828	Richibucto	20	1	78.5	0.0	78.5	78.5
1997	0828	Richibucto	23	1	75.5	0.0	75.5	75.5
1997	0828	Richibucto	24	3	77.2	15.5	69.0	84.5
1997	0828	Richibucto	25	7	83.4	9.0	78.5	87.5
1998	0825	Richibucto	5	12	87.7	37.5	71.0	108.5
1998	0825	Richibucto	6	1	88.0	0.0	88.0	88.0
1998	0825	Richibucto	14	7	84.9	16.5	77.0	93.5
1998	0827	Richibucto	19	2	77.5	7.0	74.0	81.0

Figure 1: Map illustrating locations of major rivers and estuaries mentioned in the text.

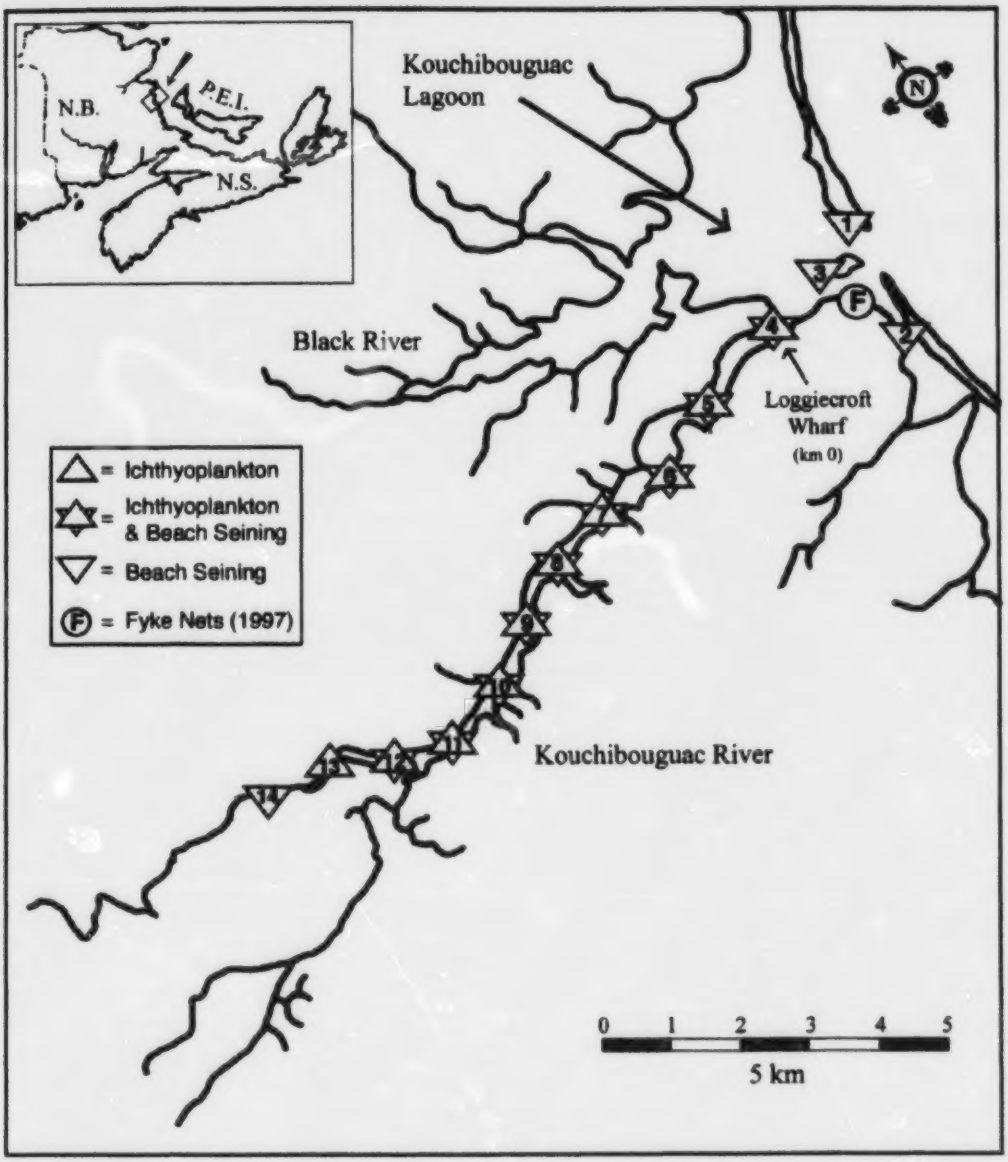

Figure 2: Map of the Kouchibouguac Estuary showing the sampling stations used during the 1997 and 1998 ichthyoplankton, beach seining, and fyke net surveys. Station 4 at Loggiecroft Wharf was chosen as km 0.

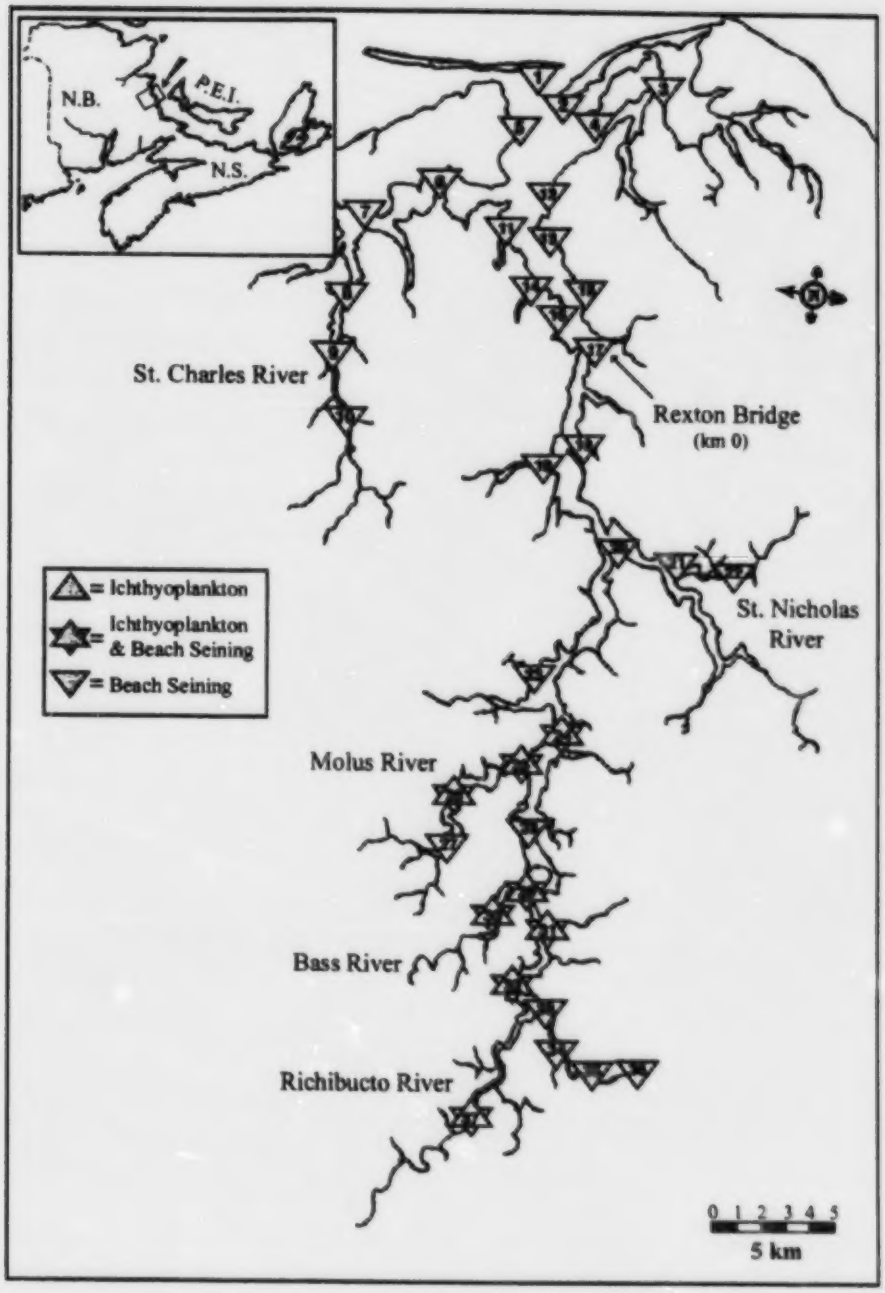

Figure 3: Map of the Richibucto Estuary showing the sampling stations used during the 1997 and 1998 ichthyoplankton and beach seining surveys. Station 17, located in the town of Rexton, was chosen as km 0.

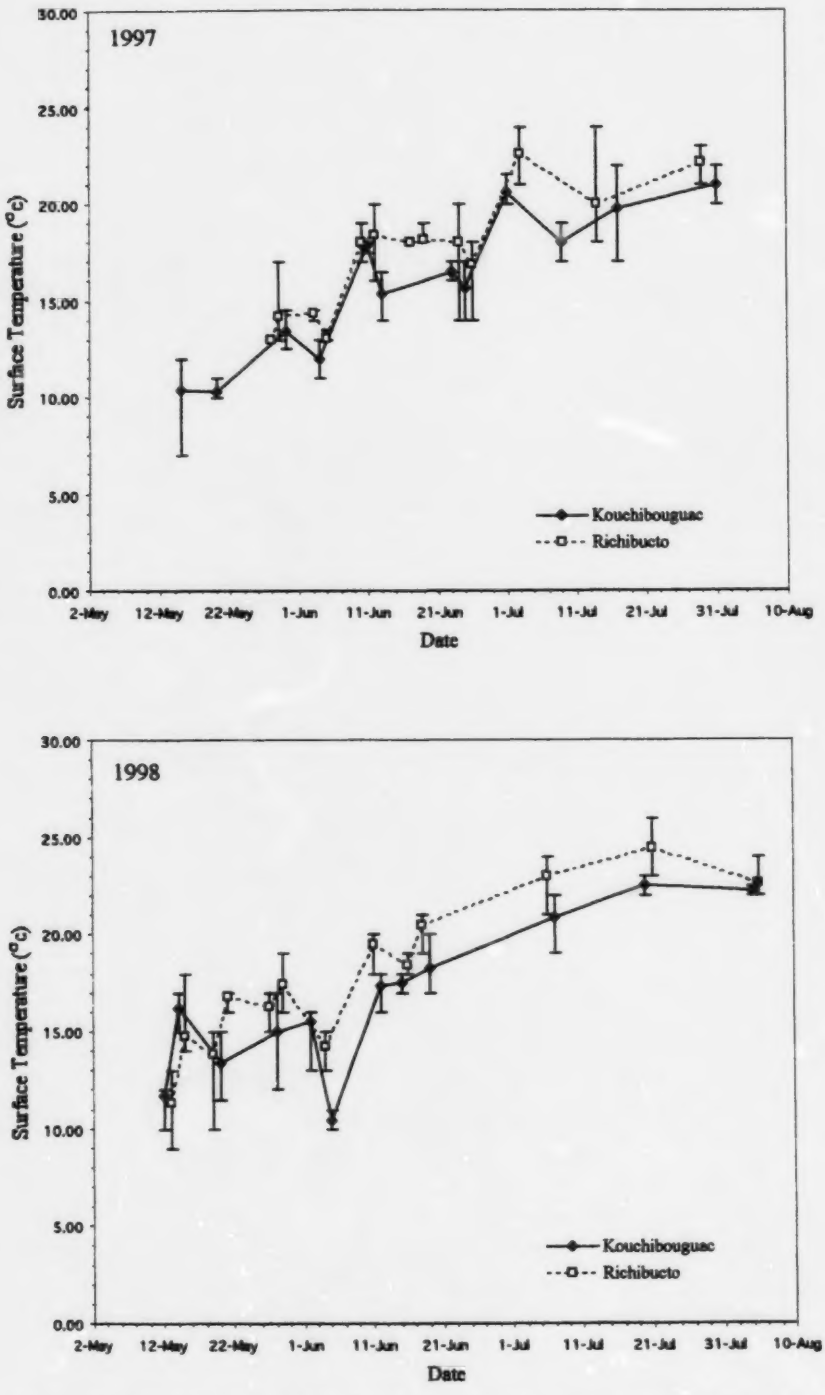

Figure 4: Mean daily surface temperatures and ranges in the Kouchibouguac and Richibucto Rivers during the 1997 and 1998 ichthyoplankton surveys.

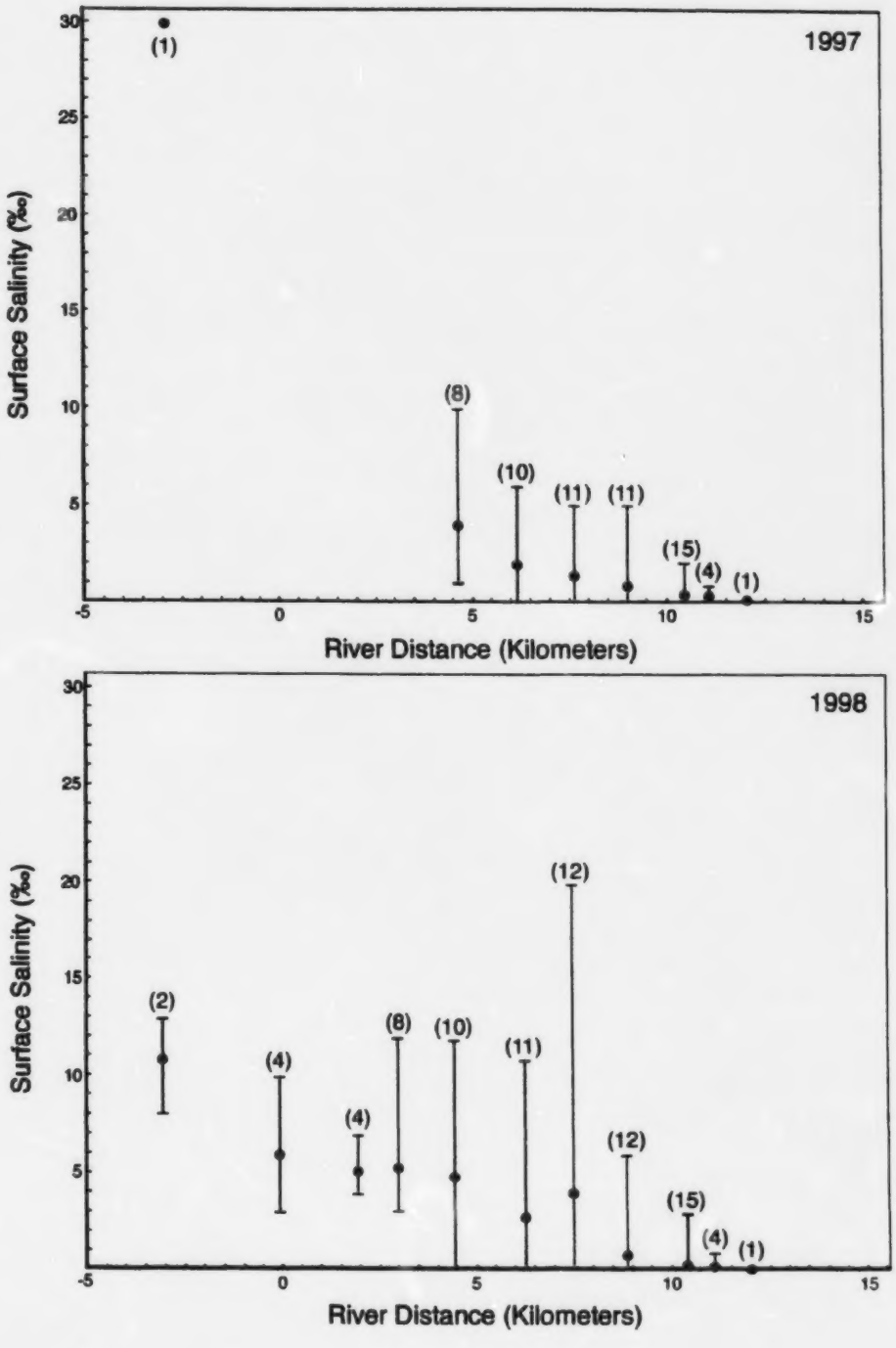

Figure 5: Mean values and range of surface salinites measured at each plankton sampling site during the 1997 and 1998 ichthyoplankton surveys in the Kouchibouguac Estuary. Numbers above the maximum range value for each site depict how many times that individual station was sampled during the year.

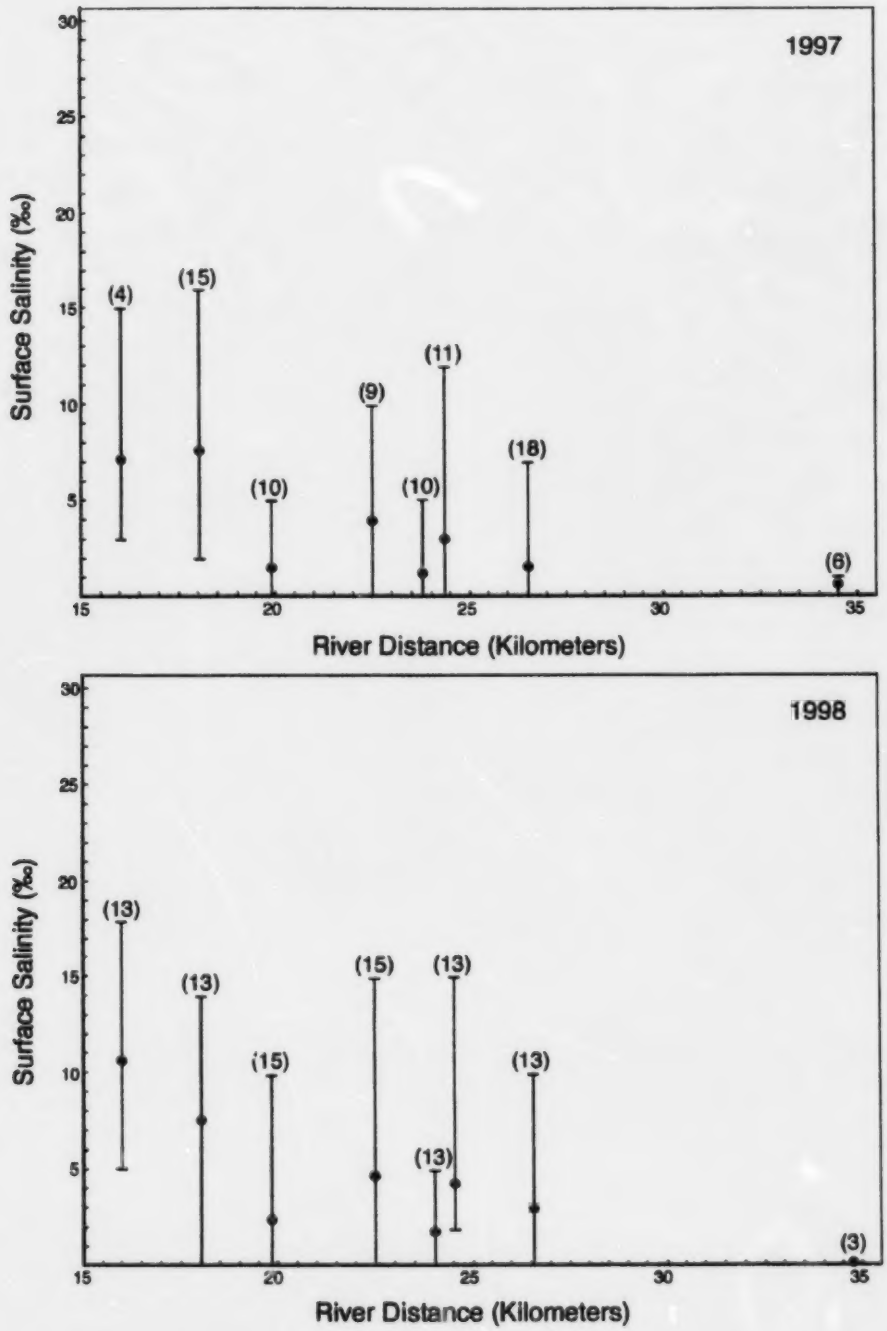

Figure 6: Mean values and range of surface salinites measured at each ichthyoplankton sampling site during the 1997 and 1998 ichthyoplankton surveys in the Richibucto Estuary. Numbers above the maximum range value for each site depict how many times that individual station was sampled during the year.

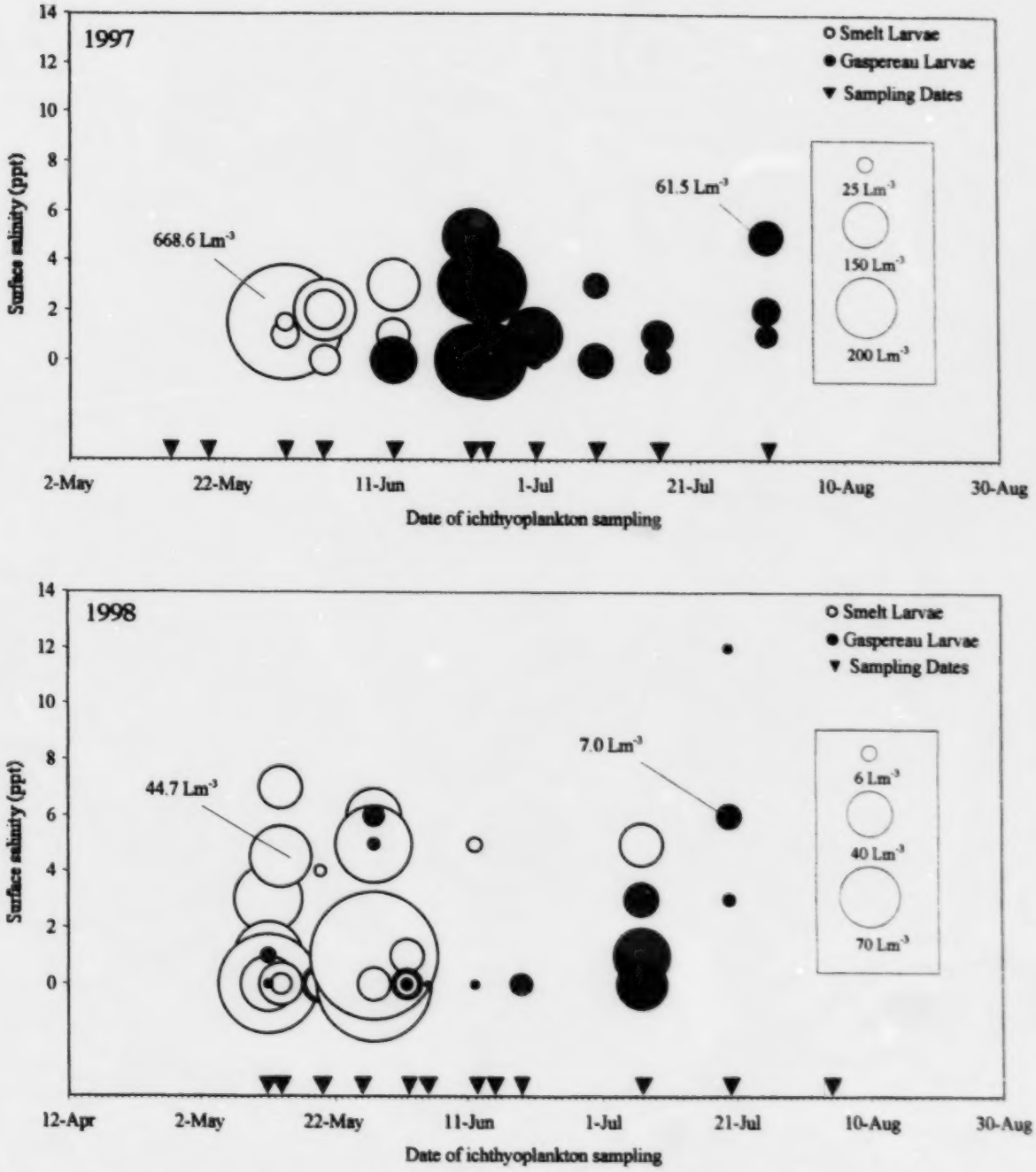

Figure 7: Distribution of anadromous ichthyoplankton in the Kouchibouguac River in the spring and summer of 1997 and 1998. Abundance values are presented as # Larvae per m^3 of water (Lm^{-3}). Actual abundance values are given for two plots to provide a representation of the scale used.

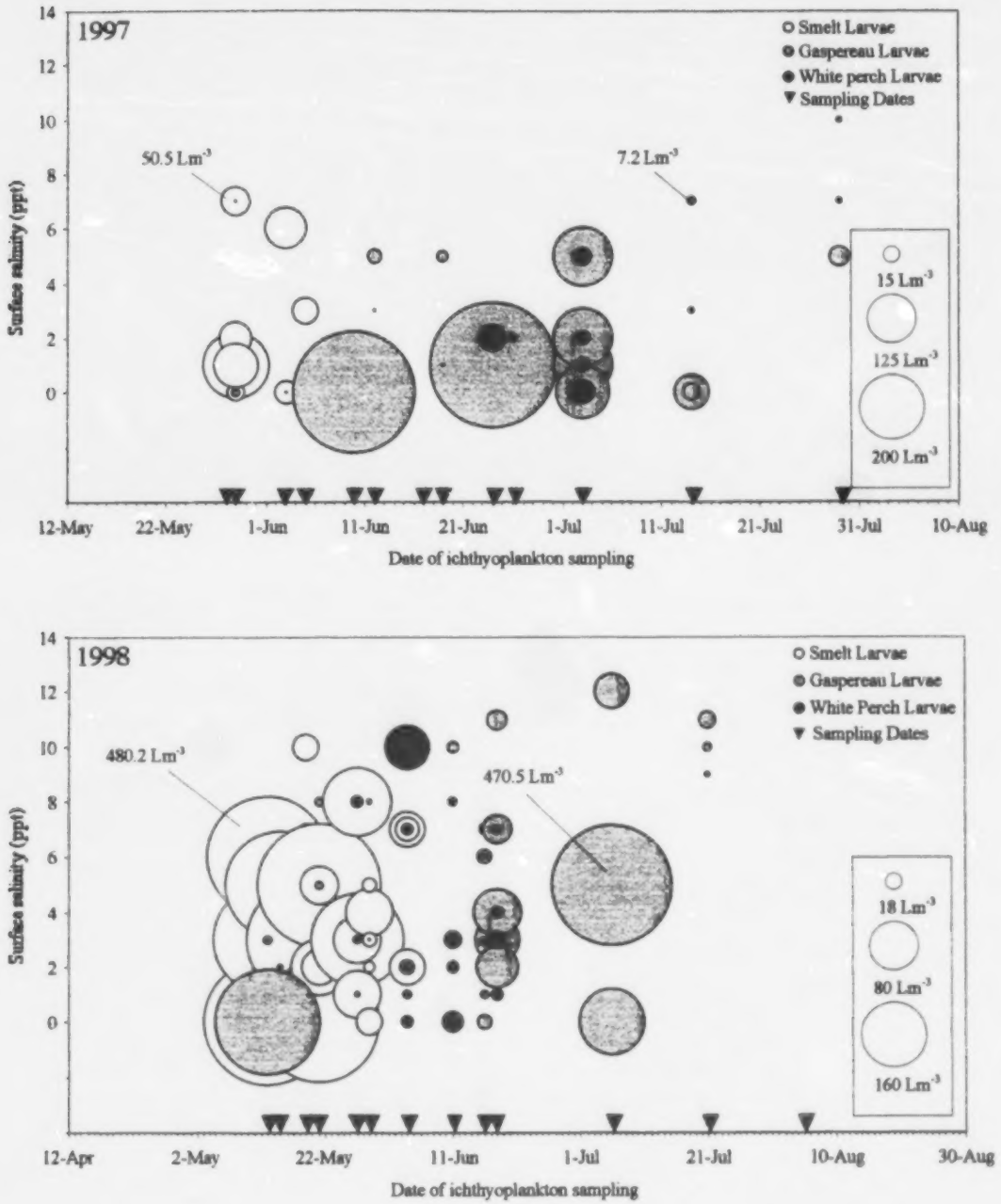

Figure 8: Distribution of anadromous ichthyoplankton in the Richibucto River in the spring and summer of 1997 and 1998. Abundance values are presented as # Larvae per m^3 of water (Lm^{-3}). Actual abundance values are given for two plots to provide a representation of the scale used.

Appendix A: Surface (S) and bottom (B) physico-chemical data (temperature (°C) and salinity (‰)) collected during the summer 1997 ichthyoplankton surveys in the Kouchibouguac (K) and Richibucto (R) Rivers. The net size is the diameter (m) of the plankton net used during a particular time. Tow Time refers to the duration of a particular ichthyoplankton tow in minutes. "X" denotes values which were not collected during a particular survey (or a survey where only physico-chemical data were collected).

River	Date (m/d)	Station	Depth (m)	S.Sal. (‰)	B.Sal. (‰)	S.Temp. (°C)	B.Temp. (°C)	Net Size (m)	Tow Time (min)
K	0515	4	2	30	30	7	7	x	x
K	0515	7	x	4	29	12	7	0.5	10
K	0515	9	x	0	27	11	6	x	x
K	0515	10	x	0.5	23	11.5	8.5	0.5	7.5
K	0515	11	2	0	1	10.5	11	0.5	7
K	0520	9	3.5	0	20	11	8	0.5	7
K	0520	10	2.5	0	18	10	9	0.5	10
K	0520	11	2	0	0	10	10	0.5	7.5
K	0530	7	4.2	1.5	23	14.5	10.5	0.5	10
K	0530	8	x	1	21	14	8.5	0.5	10
K	0530	9	x	1	19	13	10.5	0.5	10
K	0530	10	x	1.5	18	12.5	10.5	0.5	10
K	0530	11	3	0.5	0.5	13	13	0.5	10
K	0604	8	x	2	22	12	11	0.5	7
K	0604	9	x	2	22	13	10	0.5	5
K	0604	10	x	2	10	12	11	0.5	10
K	0604	11	x	0	18	11	12	0.5	10
K	0604	12	x	0	0	12	11	0.5	5
K	0611	11	2.75	0	20	18	13	0.5	<5
K	0611	11	x	0	0	17.5	17.5	0.5	<5
K	0611	13	x	0	0	18	18	x	x
K	0613	12	x	0.5	0.5	14	14	1m fixed	4 hours
K	0613	7	x	3	23	16	13	0.5	10
K	0613	8	x	2	23	16.5	13	0.5	10
K	0613	9	x	1	22	16.5	13.5	0.5	10
K	0613	10	x	0	22	15.5	13	0.5	10
K	0613	11	x	0	15	15	14	0.5	10
K	0613	12	x	0	0	14	14	0.5	10
K	0623	7	x	5	15	17	16	0.5	10
K	0623	8	x	5	18	16	15	0.5	10
K	0623	9	x	3	12	16	16	0.5	10
K	0623	10	x	0	18	17	15	0.5	10
K	0623	11	x	0	15	16.5	15	0.5	10
K	0625	12	x	0	0.5	14	14	0.5	10
K	0625	7	6	5	22	17	15	0.5	10
K	0625	8	5.5	3	22	17	15.5	0.5	10
K	0625	8	x	x	x	x	x	0.5	5
K	0625	9	4	3	20	16	16	0.5	10
K	0625	10	3	0	20	15.5	15	0.5	10
K	0625	11	3	0	17	15	15	0.5	10

Appendix A: (con't)

River	Date (m/d)	Station	Depth (m)	S.Sal. (‰)	B.Sal. (‰)	S.Temp. (°C)	B.Temp. (°C)	Net Size (m)	Tow Time (min)
K	0625	11	2.5	0	0	15	15	x	x
K	0701	8	4	1	11	21.5	18	0.5	10
K	0701	9	3	1	11	21	19	0.5	10
K	0701	10	2	0	0	20	21	0.5	10
K	0701	11	2	0	0	20	21	0.5	10
K	0709	7	x	3	15	19	15	0.5	5
K	0709	8	x	0	8	18	17	0.5	10
K	0709	9	x	0	11	18	15	0.5	10
K	0709	10	x	0	6	18	15	0.5	8
K	0709	11	3	0	18	17	11	0.5	10
K	0717	7	x	1	26	20	18	0.5	10
K	0717	8	x	0	22	21	18	0.5	10
K	0717	9	x	0	21	22	16	0.5	10
K	0717	10	x	0	12	19	18	0.5	10
K	0717	11	x	0	20	17	16	0.5	10
K	0731	7	x	10	25	22	19	0.5	10
K	0731	8	x	6	20	22	21	0.5	10
K	0731	9	x	5	22	20	20	0.5	10
K	0731	10	x	5	20	21	21	0.5	10
K	0731	11	x	1	19	20	20	0.5	6.5
K	0731	11	x	2	5	21	21	0.5	5
R	0528	24	x	3	7	13	12	1	10
R	0528	32	x	0	0.5	13	11.5	x	x
R	0528	31	x	0	2	13	11.5	x	x
R	0529	30	1	1	2.5	17	12.5	1	5
R	0529	29	x	2	4	14	12.5	1	5
R	0529	30	3	1	3	13	12	x	x
R	0529	32	6.5	0	0	13	12	1	5
R	0529	26	2	1	2	15	13	0.5	10
R	0529	25	5	7	10	13.5	12	1	5
R	0529	31	5.25	1	5	14	12	x	x
R	0603	29	x	0	4	14	14	0.5	5
R	0603	32	7	0	0	14.5	14	1	10
R	0603	25	x	6	7	14	14	0.5	8
R	0603	31	x	1	7	15	14	x	x
R	0605	29	x	3	5	13.5	13.5	1	10
R	0605	32	x	0	1	13	13	1	10
R	0605	32	x	0	1	13	13	1	10
R	0605	26	x	1	1	13	13	1	10
R	0605	25	x	9	9	13	13	x	x
R	0605	31	x	2	3	13	13	x	x
R	0610	29	x	2	8	19	17	x	x
R	0610	30	x	0	0	19	19	0.5	7
R	0610	32	6	0	8	17	14.5	1	10
R	0610	32	6	0	8	17	14.5	1	10

Appendix A: (con't)

River	Date (m/d)	Station	Depth (m)	S.Sal. (‰)	B.Sal. (‰)	S.Temp. (°C)	B.Temp. (°C)	Net Size (m)	Tow Time (min)
R	0610	32	6	0	8	17	14.5	0.5	10
R	0610	25	X	9	10	18	17	x	x
R	0610	26	X	0	0	18	18	0.5	10
R	0610	31	X	2	6	19	18	x	x
R	0612	32	X	1	3	20	19	0.5	10
R	0612	30	X	3	4	19	19	0.5	10
R	0612	32	X	5	11	19	16	0.5	10
R	0612	32.5	3	5	11	16	16	0.5	10
R	0612	37	x	0	0	19	15.5	0.5	10
R	0612	25	x	5	11	19	18	0.5	10
R	0612	26	x	1	1	17	17	0.5	10
R	0617	26	x	2	2	18	18	1	10
R	0619	25	2.5	12	16	18	17	x	x
R	0619	29	x	9	16	18	16	x	x
R	0619	32	6.5	7	13	18	17	x	x
R	0619	37	x	1	4	18	18	0.5	10
R	0619	37	x	1	4	18	18	1	5
R	0619	26	x	5	5	19	19	0.5	10
R	0619	31	x	12	20	18	15	x	x
R	0624	32	0.8	1	1	16	16	0.5	10
R	0624	29	x	10	17	21	19	x	x
R	0624	32	7.2	2	12	20	19	1	10
R	0624	37	x	1	1	16	16	0.5	10
R	0624	25	x	8	13	19	19	1	10
R	0624	26	x	0.5	1	14	13	0.5	5
R	0624	25	x	16	16	20	19	x	x
R	0624	31	x	2	10	21	19	x	x
R	0624	26	x	0	0	15	15	0.5	10
R	0626	30	x	0	3.5	17	17	1	8
R	0626	30.5	x	0	0	16	16	1	3
R	0626	29	3.5	5	10	18	18.5	x	x
R	0626	30	1.5	2	7	18	18	1	8
R	0626	32	6	2	9	17	19	1	10
R	0626	25	1.5	9	11	17	18	x	x
R	0626	37	x	0	0	14	14	1	10
R	0626	31	4	4	11	18	18	x	x
R	0703	29	x	1	3	23	23	1	10
R	0703	24	7	5	13	24	20	1	10
R	0703	30	1	0	0	21	21	0.5	10
R	0703	32	6.4	0	0	22	22	1	10
R	0703	25	x	2	5	24	23	1	10
R	0703	26	x	0	0	21	21	0.5	10
R	0703	25	1.5	2	5	24	23	x	x
R	0703	31	4.2	0	6	22	20	1	10
R	0714	24	7	6	22	22	15	1	10

Appendix A: (con't)

River	Date (m/d)	Station	Depth (m)	S.Sal. (‰)	B.Sal. (‰)	S.Temp. (°C)	B.Temp. (°C)	Net Size (m)	Tow Time (min)
R	0714	29	5.5	3	15	24	17	1	5
R	0714	30	x	0	2.5	24	23	0.5	10
R	0714	32	x	0	15	21	18	1	7.5
R	0714	37	x	0	0	18	18	0.5	5
R	0714	25	2.5	7	15	23	19	0.5	10
R	0714	25.5	x	3	5	25	24	x	x
R	0714	26	x	0	0	21	21	0.5	10
R	0714	31	3.5	3	15	2	18.5	x	x
R	0729	25	x	10	13	23	20	1	10
R	0729	24	x	15	15	23	22	1	10
R	0729	30	x	5	11	21	22	0.5	10
R	0729	32	6	7	12	22	21	1	8.5
R	0729	25	x	11	12	22	21	x	x
R	0729	31	3.5	8	14	22	21	x	x

Appendix B: Surface (S) and bottom (B) physico-chemical data (temperature (°C) and salinity (‰)) collected during the summer 1998 ichthyoplankton surveys in the Kouchibouguac (K) and Richibucto (R) Rivers. The net size is the diameter (m) of the plankton net used during a particular time. Tow Time refers to the duration of a particular ichthyoplankton tow in minutes. "X" denotes values which were not collected during a particular survey (or a survey where only physico-chemical data were collected).

River	Date (m/d)	Station	Depth (m)	S.Sal. (‰)	B.Sal. (‰)	S.Temp. (°C)	B.Temp. (°C)	Net Size (m)	Tow Time (min)
K	0512	2	2	13	16	12	12	x	x
K	0512	2	2	8	17	21	10	x	x
K	0512	4	3	3	20	12	9	0.5	6
K	0512	5	3.5	4	15	12	10	0.5	5
K	0512	6	5	3	26	12	9	0.5	6
K	0512	7	5	3	21	12	10	0.5	10
K	0512	8	5.5	0	17	12	10	0.5	10
K	0512	9	4.5	1	20	12	9	0.5	8
K	0512	10	3.5	0	5	11	10	0.5	10
K	0512	11	3	0	0	10	9	0.5	10
K	0514	4	6	10	26.5	17	11	x	x
K	0514	5	3	7	25.5	17	11	0.5	8
K	0514	6	4	4.5	25	17	13	0.5	8
K	0514	7	4	0	24	16.5	12	0.5	9
K	0514	8	3.5	0	20	16	13	0.5	9
K	0514	9	3	0	11	16	18	0.5	10
K	0514	10	2	0	9	15.5	14	0.5	10
K	0514	11	2.5	0	12	15	14	0.5	10
K	0520	7	4	4	18	15	14	0.5	8
K	0520	8	3	0	16	14	13	0.5	10
K	0520	9	2	0	18	14	12	0.5	10
K	0520	10	2	0	17	12.5	12	0.5	8
K	0520	11	2	0	13.5	11.5	12	0.5	9
K	0528	6	2.7	6	22	17	13	0.5	10
K	0528	7	4	5	24	16	13	0.5	10
K	0528	8	3	0	16	16	14	0.5	10
K	0528	9	3	0	16	16	14	0.5	10
K	0528	10	2	1	17	14	14	0.5	10
K	0528	11	2	0	16	14	13	0.5	10
K	0528	12	2	0	0	12	15	0.5	9
K	0602	4	1.5	6	21	17	13	x	x
K	0602	5	5	5	25	17	12	x	x
K	0602	6	4	5	23	17	13	x	x
K	0602	7	5	5	23	16	12	0.5	10
K	0602	8	4	1	21	16	13	0.5	10
K	0602	9	4	0	20	16	13	0.5	8
K	0602	10	2	0	20	15	13	0.5	10
K	0602	11	2	0	14	13	12	0.5	10
K	0602	12	2	0	0	13	13	0.5	5
K	0605	9	2	20	20	11	12	0.5	10

Appendix B: (con't)

River	Date (m/d)	Station	Depth (m)	S.Sal. (‰)	B.Sal. (‰)	S.Temp. (°C)	B.Temp. (°C)	Net Size (m)	Tow Time (min)
K	0605	10	2	5	23	11	12	x	x
K	0605	11	2	1	23	10	12	0.5	10
K	0605	12	1.5	1	16	10	12	0.5	10
K	0605	13	1	0	0	10	10	0.5	10
K	0612	4	x	x	x	x	x	x	x
K	0612	5	x	x	x	x	x	x	x
K	0612	6	x	x	x	x	x	x	x
K	0612	7	4.5	5	20	18	16	0.5	10
K	0612	8	3.5	3	20	18	15	0.5	10
K	0612	9	4	6	21	18	15	0.5	8
K	0612	10	2	5	20	17	15	0.5	10
K	0612	11	2.5	0	14	16	14	0.5	10
K	0612	11	1	0	0	17	17	0.5	10 (walking)
K	0615	8	4	4	22	18	16	0.5	10
K	0615	9	4	4	20	18	15.5	0.5	10
K	0615	10	2	2	15	17	16	0.5	8
K	0615	11	2.5	0	15	17	15	0.5	10
K	0619	6	3	4	24	20	18	0.5	10
K	0619	7	4.5	0	20	19	19	0.5	10
K	0619	8	3.5	0	19	19	16	0.5	10
K	0619	9	3.2	0	18	18	19	0.5	10
K	0619	10	3.5	1	17	18	17	0.5	10
K	0619	11	1.5	0	5	17	17	0.5	10
K	0619	12	0.5	0	0	17	17	0.5	5
K	0707	6	3	5	20	22	19	0.5	10
K	0707	7	4	3	21	22	19	0.5	10
K	0707	8	2	3	17	21	19	0.5	10
K	0707	9	3.5	1	20	21	18	0.5	10
K	0707	10	2	0	19	19	18	0.5	10
K	0707	11	2	0	20	20	19	0.5	10
K	0707	11	0.75	0	1	21	21	0.5	5
K	0720	6	4	12	26	23	22	0.5	10
K	0720	7	2.5	12	23	23	22	0.5	10
K	0720	8	3	11	24	23	22	0.5	10
K	0720	9	3	11	24	23	21	0.5	10
K	0720	10	3	6	23	22	21	0.5	10
K	0720	11	2	3	24	22	20	0.5	10
K	0720	11	0.75	0	20	22	21	0.5	10
K	0804	7	3	11	22	22.5	20.5	0.5	10
K	0804	8	3	9	25	22	18	0.5	10
K	0804	9	3	5	24	22.5	19	0.5	10
K	0804	10	2	2	22	22	20	0.5	10
K	0804	11	2	1	20	22	20	0.5	10
R	0513	24	5	6	7	12.5	8	0.5	11
R	0513	29	2	0	0	9	9	0.5	8

Appendix B: (con't)

River	Date (m/d)	Station	Depth (m)	S.Sal. (‰)	B.Sal. (‰)	S.Temp. (°C)	B.Temp. (°C)	Net Size (m)	Tow Time (min)
R	0513	30	2	0	0	11	12	x	x
R	0513	32	5	1	2	13	10	0.5	10
R	0513	25	2	0	1	10	9	0.5	11
R	0513	26	2	0	0	11	9	x	x
R	0513	31	2.5	3	4	13	9.5	0.5	11
R	0515	24	5.5	5	5	14	8.5	0.5	10
R	0515	29	3	1	5	14.5	11	0.5	10
R	0515	30	2	2	6	18	11	0.5	6
R	0515	32	3	2	4	14	11	0.5	7
R	0515	25	2.5	5	8	14	11	0.5	10
R	0515	26	1	1	2	15	12	0.5	8
R	0515	31	3	3	4	14	11	x	x
R	0519	24	7	10	16	13	8	0.5	10
R	0519	29	2	2	8	10	9	0.5	10
R	0519	30	2	0	4	14	15	0.5	8
R	0519	32	6	0	7	15	10	0.5	10
R	0519	25	3	7	10	15	13	0.5	10
R	0519	26	2	3	4	15	11	0.5	10
R	0519	31	3	2	6	15	10	x	x
R	0521	24	6	8	17	16	14	0.5	10
R	0521	29	2	5	12	17	17	0.5	8
R	0521	30	2.5	0	6	17	18	0.5	8
R	0521	32	5	2	11	17	16	0.5	10
R	0521	25	3	5	9	17	16	0.5	10
R	0521	26	1.5	2	2	17	17	0.5	8
R	0521	31	3.5	6	12	17	17	x	x
R	0527	24	8	15	14	15	14	0.5	10
R	0527	29	3	3	4	17	12	0.5	10
R	0527	30	2	1	2	16	16	0.5	8
R	0527	32	4.5	1	1	16	16	0.5	10
R	0527	29	2	8	11	17	11	0.5	10
R	0527	30	1.2	3	4	17	16	0.5	10
R	0527	31	2.5	1.5	3	16	16	0.5	10
R	0529	24	4	8	9	16	14	0.5	9
R	0529	29	2	4	4	19	19	0.5	10
R	0529	30	2	2	7	18	18	0.5	10
R	0529	32	6	0	0	18	19	0.5	10
R	0529	25	2.5	5	6	16	17	0.5	10
R	0529	26	1.5	3	4	17	17	0.5	10
R	0529	31	3	2	3	18	18	x	x
R	0604	24	6.5	7	24	13	13	0.5	10
R	0604	29	3	2	14	14	15	0.5	10
R	0604	30	2.5	1	8	15	16	0.5	10
R	0604	32	6.5	10	14	14	16	0.5	10
R	0604	25	2	7	11	15	14	0.5	10

Appendix B: (con't)

River	Date (m/d)	Station	Depth (m)	S.Sal. (‰)	B.Sal. (‰)	S.Temp. (°C)	B.Temp. (°C)	Net Size (m)	Tow Time (min)
R	0604	26	1.5	2	5	15	15	0.5	10
R	0604	29	2	5	x	14	x	x	x
R	0604	25	2	8	10	15	15	x	x
R	0604	37	2.5	0	1	13	13	0.5	10
R	0604	31	2	6	15	15	16	x	x
R	0604	26	1	0	0	14	14	0.5	8
R	0611	24	4	10	15	18	16	0.5	10
R	0611	29	3.5	2	6	20	18	0.5	10
R	0611	30	1.5	0	0	20	18	0.5	10
R	0611	30	1.5	0	0	20	18	0.5	handheld
R	0611	32	6	0	6	20	18	0.5	10
R	0611	25	2.5	8	10	18	17	0.5	10
R	0611	26	1.5	3	5	20	18	0.5	10
R	0611	31	3	x	x	x	x	x	x
R	0611	26	1.5	0	0	20	20	0.5	5
R	0616	24	4	11	16	18	17	0.5	10
R	0616	29	2.5	6	10	19	19	0.5	10
R	0616	30	2	0	7	18	19	0.5	10
R	0616	32	7	2	7	19	19	0.5	10
R	0616	25	2	7	9	18	19	0.5	10
R	0616	26	2	3	5	19	20	0.5	10
R	0616	31	3.5	5	8	19	19	x	x
R	0616	37	2.5	0	0	18	17	0.5	10
R	0616	26	1.5	1	2	18	18	0.5	10
R	0618	24	4	11	17	20	18	0.5	10
R	0618	29	2.5	3	10	21	20	0.5	10
R	0618	30	2	1	7	20	19	0.5	10
R	0618	32	7	2	10	20	19	0.5	10
R	0618	25	3	7	12	21	21	0.5	10
R	0618	26	1.5	4	5	21	21	0.5	10
R	0618	31	2.5	3	10	21	19	x	x
R	0618	37	2	0	0	19	17	0.5	10
R	0618	26	1	0	0	21	20	0.5	10
R	0706	24	7	12	22	21	19	0.5	10
R	0706	29	1.5	5	14	24	22	x	x
R	0706	32	5	0	15	23	20	0.5	9
R	0706	25	1.5	12	13	22	17	0.5	5
R	0706	26	0.5	3	2	24	24	0.5	?
R	0706	31	2	5	9	24	22	0.5	10
R	0721	24	7	17	18	23	24	0.5	10
R	0721	29	2	10	10	25	25	0.5	8
R	0721	30	1.5	5	14	26	25	0.5	10
R	0721	32	3.5	9	12	23	23	0.5	10
R	0721	25	2	11	11	24	23	0.5	8
R	0721	26	0.5	10	10	25	24	0.5	6

Appendix B: (con't)

River	Date (m/d)	Station	Depth (m)	S.Sal. (‰)	B.Sal. (‰)	S.Temp. (°C)	B.Temp. (°C)	Net Size (m)	Tow Time (min)
R	0721	31	2	12	13	25	24	X	x
R	0805	24	7	18	23	22	19	0.5	10
R	0805	29	1.5	15	20	24	20	0.5	10
R	0805	32	4	10	22	22	18	0.5	10
R	0805	25	1.5	15	20	22	21	0.5	10
R	0805	31	2	15	16	23	20	0.5	10

Appendix C: Raw ichthyoplankton counts from all 1997 ichthyoplankton sampling. Species codes are 1=rainbow smelt, 2=gaspereau, 3=Atlantic silverside, 4=fundulids, 5=gasterosteids, 6=white perch, 7=Atlantic tomcod, 8=smooth flounder, 9=white sucker. River codes are K=Kouchibouguac, and R=Richibucto. Eggs are denoted by an asterisk.

River	Date (m/d)	Stn.	Species								
			1	2	3	4	5	6	7	8	9
K	0515	7	0	0	0	0	0	0	0	0	0
K	0515	10	0	0	0	0	0	0	0	0	0
K	0515	11	0	0	0	0	0	0	0	0	0
K	0520	9	0	0	0	0	0	0	0	0	0
K	0520	10	1*	0	0	0	0	0	0	0	0
K	0520	11	0	0	0	0	0	0	0	0	0
K	0530	7	67	0	0	0	0	0	0	0	0
K	0530	8	0	0	0	0	0	0	0	0	0
K	0530	9	5	0	0	0	0	0	0	0	0
K	0530	10	2	0	0	0	0	0	0	0	0
K	0530	11	0	0	0	0	0	0	0	0	0
K	0604	8	10	0	0	0	0	0	0	0	0
K	0604	9	1	0	0	0	0	0	0	0	0
K	0604	10	0	0	0	0	0	0	0	0	0
K	0604	11	6	46*	0	0	2	0	0	0	0
K	0604	12	0	0	0	0	0	0	0	0	0
K	0611	11	1	0	0	0	0	0	0	0	0
K	0611	11	0	0	0	0	0	0	0	0	0
K	0611	13	2	0	0	0	0	0	0	0	0
K	0613	12	15	13*	0	0	0	0	0	0	0
K	0613	7	9	11*	0	0	0	0	0	0	0
K	0613	8	0	0	0	0	0	0	0	0	0
K	0613	9	4	1*	0	0	0	0	0	0	0
K	0613	10	0	1	0	0	0	0	0	0	0
K	0613	11	0	5	0	0	0	0	0	0	0
K	0613	12	0	4*	0	0	0	0	0	0	0
K	0623	7	0	4	2	0	0	0	0	0	0
K	0623	8	0	16	0	0	0	0	0	0	0
K	0623	9	1	21	0	0	0	0	0	0	0
K	0623	10	0	14	0	0	0	0	0	0	0
K	0623	11	0	8	0	0	1	0	0	0	0
K	0625	12	0	36 (33*)	0	0	0	0	0	0	0
K	0625	7	0	1	0	0	0	0	0	0	0
K	0625	8	1	0	0	0	0	0	0	0	0
K	0625	8	0	23 (15*)	0	0	0	0	0	0	0
K	0625	9	0	28	0	0	1	0	0	0	0
K	0625	10	0	18	0	0	0	0	0	0	0
K	0625	11	0	0	0	0	0	0	0	0	0
K	0701	8	0	0	0	0	0	0	0	0	0
K	0701	9	0	7	0	0	0	0	0	0	0
K	0701	10	0	0	0	0	0	0	0	0	0
K	0701	11	0	1	0	0	0	0	0	0	0

Appendix C: (con't)

River	Date (m/d)	Stn.	Species								
			1	2	3	4	5	6	7	8	9
K	0709	7	0	2	0	0	0	0	0	0	0
K	0709	8	0	9	0	0	0	0	0	0	0
K	0709	9	0	2	0	0	0	0	0	0	0
K	0709	10	0	2	0	0	0	0	0	0	0
K	0709	11	0	0	0	0	0	0	0	0	0
K	0717	7	0	3	0	0	0	0	0	0	0
K	0717	8	0	0	0	0	0	0	0	0	0
K	0717	9	0	3	0	0	1	0	0	0	0
K	0717	10	0	0	0	0	0	0	0	0	0
K	0717	11	0	0	0	0	0	0	0	0	0
K	0731	7	0	0	0	0	0	0	0	0	0
K	0731	8	0	0	0	0	0	0	0	0	0
K	0731	9	0	0	0	0	0	0	0	0	0
K	0731	10	0	6	0	0	0	0	0	0	0
K	0731	11	0	2	0	0	0	0	0	0	0
K	0731	11	0	1	0	0	0	0	0	0	0
R	0528	24	0	0	0	0	0	0	0	0	0
R	0529	30	318	0	0	0	0	0	0	0	0
R	0529	29	224	0	0	0	0	0	0	1	0
R	0529	32	54	20	0	0	0	0	0	0	0
R	0529	26	93	0	0	0	0	0	0	0	0
R	0529	25	116	0	0	0	0	2	0	0	0
R	0603	29	13	0	0	0	0	0	0	0	0
R	0603	32	0	8	0	0	0	0	1	0	0
R	0603	25	56	0	0	0	0	0	0	0	0
R	0605	29	113	0	0	0	0	0	0	0	0
R	0605	32	57	0	0	0	0	0	2	0	0
R	0605	32	0	0	0	0	0	0	0	0	0
R	0605	26	8	0	0	0	0	0	0	0	0
R	0605	25	500	0	0	0	0	0	0	0	0
R	0605	31	0	0	0	0	0	0	0	0	0
R	0610	29	11	0	0	0	0	0	0	0	0
R	0610	30	0	0	0	0	0	0	0	0	0
R	0610	32	1*	0	0	0	1	0	0	0	0
R	0610	32	278	5	0	0	0	0	0	0	0
R	0610	32	20	15*	0	0	0	0	0	0	0
R	0610	26	5	500	0	0	0	0	0	0	0
R	0612	32	0	0	0	0	0	0	0	0	0
R	0612	30	1	0	0	0	0	0	0	0	0
R	0612	32	0	2	0	0	0	0	0	0	0
R	0612	32	0	0	0	0	0	0	0	0	0
R	0612	37	0	0	0	0	0	0	0	0	0
R	0612	25	0	13	0	0	0	0	0	0	0
R	0612	26	0	0	0	0	0	0	0	0	0
R	0617	26	0	5*	0	0	0	0	0	0	0

Appendix C: (con't)

River	Date (m/d)	Stn.	Species								
			1	2	3	4	5	6	7	8	9
R	0619	37	0	0	0	0	0	0	0	0	0
R	0619	37	2	0	0	0	1	1	0	0	0
R	0619	26	0	4 (265*)	0	0	0	0	0	0	0
R	0624	32	0	500	0	0	0	0	0	0	0
R	0624	32	0	25 (13*)	0	0	1	150	0	0	0
R	0624	37	0	0	0	0	0	0	0	0	0
R	0624	25	0	0	0	0	0	0	0	0	0
R	0624	26	0	55*	0	0	0	0	0	0	0
R	0624	26	0	349*	0	0	0	0	0	0	0
R	0626	30	0	68*	0	0	0	62*	0	0	0
R	0626	30	0	69 (68*)	0	0	4	0	0	0	0
R	0626	30	0	15	0	4	1	5	0	0	0
R	0626	32	0	0	0	0	0	0	0	0	0
R	0626	37	0	61*	0	0	0	1*	0	0	0
R	0703	29	0	517	0	0	3	34	0	0	0
R	0703	24	0	571	0	0	0	59	0	0	0
R	0703	30	0	0	0	0	0	0	0	0	0
R	0703	32	2	406 (1*)	0	0	0	19	0	0	0
R	0703	25	0	692	40	0	0	52	0	0	0
R	0703	26	0	88	0	0	0	0	0	0	0
R	0703	31	0	510	0	0	0	98	0	0	0
R	0714	24	0	0	0	0	0	0	0	0	0
R	0714	29	0	7	0	0	0	3	0	0	0
R	0714	30	0	2	0	0	1	0	0	0	0
R	0714	32	0	135	0	0	4	0	0	0	0
R	0714	37	0	6 (5*)	0	0	0	0	0	0	0
R	0714	25	0	8	0	0	1	0	0	0	0
R	0714	26	0	0	0	0	3	0	0	0	0
R	0729	25	0	6	0	0	0	0	0	0	0
R	0729	24	0	0	0	0	0	0	0	0	0
R	0729	30	0	11	0	0	2	0	0	0	0
R	0729	32	0	4	0	15	0	0	0	0	0

Appendix D: Raw ichthyoplankton counts from all 1998 ichthyoplankton sampling. Species codes are 1=rainbow smelt, 2=gaspereau, 3=Atlantic silverside, 4=fundulids, 5=gasterosteids, 6=white perch, 7=Atlantic tomcod, 8=smooth flounder, 9=white sucker. River codes are K=Kouchibouguac, R=Richibucto. Eggs are denoted by an asterisk.

River	Date (m/d)	Stn.	Species								
			1	2	3	4	5	6	7	8	9
K	0512	4	11	0	0	0	0	0	0	0	0
K	0512	5	0	0	0	0	0	0	0	0	0
K	0512	6	0	0	0	0	0	0	0	0	0
K	0512	7	38	0	0	0	0	0	0	0	0
K	0512	8	78	0	0	0	0	0	0	0	0
K	0512	9	37	2	0	0	0	0	0	0	0
K	0512	10	76	1	0	0	0	0	0	0	0
K	0512	11	39	0	0	0	0	0	0	0	0
K	0514	5	7	0	0	0	0	0	0	0	0
K	0514	6	22	0	0	0	0	0	0	0	0
K	0514	7	0	0	0	0	0	0	0	0	0
K	0514	8	0	0	0	0	0	0	0	0	0
K	0514	9	0	0	0	0	0	0	0	0	0
K	0514	10	12	0	0	0	0	0	1	0	0
K	0514	11	5	0	0	0	0	0	0	0	0
K	0520	7	2	0	0	0	0	0	0	0	0
K	0520	8	16	0	0	0	0	0	0	0	0
K	0520	9	0	0	0	0	0	0	0	0	0
K	0520	10	12	0	0	0	0	0	0	0	0
K	0520	11	1	0	0	0	0	0	0	0	0
K	0528	6	18	3	0	0	0	0	0	0	0
K	0528	7	62	2	0	0	0	0	0	0	0
K	0528	8	85	0	0	0	0	0	0	0	0
K	0528	9	106	0	0	0	1	0	0	0	0
K	0528	10	72	0	0	0	0	0	0	0	0
K	0528	11	17	0	0	0	1	0	0	0	0
K	0528	12	14	0	0	0	0	0	0	0	0
K	0602	7	0	0	0	0	0	0	0	0	0
K	0602	8	12	0	0	0	0	0	0	0	0
K	0602	9	6	0	0	0	0	0	0	0	0
K	0602	10	11	0	0	0	0	0	0	0	0
K	0602	11	9	0	0	0	0	0	0	0	0
K	0602	12	4	1	0	0	0	0	0	0	0
K	0605	9	0	0	0	0	0	0	0	0	0
K	0605	10	0	0	0	0	0	0	0	0	0
K	0605	11	0	0	0	0	0	0	0	0	0
K	0605	12	0	0	0	0	0	0	0	0	0
K	0605	13	1	0	0	0	0	0	0	0	0
K	0612	7	2	0	0	0	0	0	0	0	0
K	0612	8	0	0	0	0	0	0	0	0	0
K	0612	9	0	0	0	0	0	0	0	0	0

Appendix D: (con't)

River	Date (m/d)	Stn.	Species								
			1	2	3	4	5	6	7	8	9
K	0612	10	3	0	0	0	0	0	0	0	0
K	0612	11	1	1	0	0	0	0	0	0	0
K	0612	11	0	0	0	0	0	0	0	0	0
K	0615	8	0	0	0	0	1	0	0	0	0
K	0615	9	0	0	0	0	0	0	0	0	0
K	0615	10	0	0	0	0	0	0	0	0	0
K	0615	11	0	0	0	0	0	0	0	0	0
K	0619	6	0	0	27	0	0	0	0	0	0
K	0619	7	0	0	0	0	0	0	0	0	0
K	0619	8	0	1	0	0	0	0	0	0	0
K	0619	9	0	2	0	0	0	0	0	0	0
K	0619	10	0	0	0	0	72	0	0	0	0
K	0619	11	0	1	1	0	1	0	0	0	0
K	0619	12	0	2	0	0	0	0	0	0	0
K	0707	6	18	0	7	0	0	0	0	0	0
K	0707	7	0	5	4	0	0	0	0	0	0
K	0707	8	0	6	4	0	0	0	0	0	0
K	0707	9	0	26	0	0	0	0	0	0	0
K	0707	10	0	13	0	0	0	0	0	0	0
K	0707	11	0	3	0	0	0	0	0	0	0
K	0707	11	0	0	0	0	4	0	0	0	0
K	0720	6	0	0	0	0	0	0	0	0	0
K	0720	7	0	1	16	0	1	0	0	0	0
K	0720	8	0	0	5	0	0	0	0	0	0
K	0720	9	0	0	0	0	0	0	0	0	0
K	0720	10	0	5	0	0	7	0	0	0	0
K	0720	11	0	2	0	0	0	0	0	0	0
K	0720	11	0	0	0	0	0	0	0	0	0
K	0804	7	0	0	0	0	0	0	0	0	0
K	0804	8	0	0	0	0	0	0	0	0	0
K	0804	9	0	0	0	0	3	0	0	0	0
K	0804	10	0	0	7	0	0	0	0	0	0
K	0804	11	0	0	0	0	1	0	0	0	0
R	0513	24	500	0	0	0	0	0	0	0	0
R	0513	29	500	0	0	0	0	0	0	0	0
R	0513	32	385	9	0	0	0	0	0	0	0
R	0513	25	2	244	0	0	0	0	0	0	0
R	0513	31	402	4	0	0	0	0	0	0	0
R	0515	24	143	0	0	0	0	0	0	0	0
R	0515	29	117	0	0	0	0	0	0	0	0
R	0515	30	0	0	0	0	0	0	0	0	0
R	0515	32	173	3	0	0	0	0	0	0	0
R	0515	25	525	0	0	0	0	0	0	0	0
R	0515	26	17	0	0	0	0	0	0	0	0
R	0519	24	30	0	0	0	0	0	0	0	0

Appendix D: (con't)

River	Date (m/d)	Stn.	Species								
			1	2	3	4	5	6	7	8	9
R	0519	29	42	0	0	0	0	0	0	0	0
R	0519	30	16	0	0	0	0	0	0	0	0
R	0519	32	60	0	0	0	0	0	0	0	0
R	0519	25	4	0	0	0	0	0	0	0	0
R	0519	26	528	0	0	0	0	0	0	0	0
R	0521	24	3	2	0	0	0	0	0	0	0
R	0521	29	500	0	0	0	0	0	0	0	0
R	0521	30	299	0	0	0	0	0	0	0	0
R	0521	32	119	0	0	0	0	0	0	0	0
R	0521	25	30	2	0	0	1	0	0	0	0
R	0521	26	35	0	0	0	0	0	0	0	0
R	0527	24	3	1	0	0	2	0	0	0	0
R	0527	29	170	0	0	0	0	2	0	0	0
R	0527	30	20	0	0	0	4	1	0	0	0
R	0527	32	99	0	0	0	2	2	0	0	0
R	0527	29	206	0	0	0	0	8	0	0	0
R	0527	30	61	0	0	0	0	0	0	0	0
R	0527	31	0	0	0	0	0	0	0	0	0
R	0529	24	1	0	0	0	2	0	0	0	0
R	0529	29	59	0	0	0	0	0	0	0	0
R	0529	30	7	0	0	0	7	0	0	0	0
R	0529	32	31	0	0	0	1	0	0	0	0
R	0529	25	12	0	0	0	0	0	0	0	0
R	0529	26	10	1	0	0	1	0	0	0	0
R	0604	24	31	4	15	0	0	0	0	0	0
R	0604	29	42	1	0	0	0	4	0	0	0
R	0604	30	3	0	0	0	0	2	0	0	0
R	0604	32	1	3	0	0	0	43	0	0	0
R	0604	25	21	1	27	0	0	2	0	0	0
R	0604	26	5	3	5	0	0	2	0	0	0
R	0604	37	1	2*	0	0	0	5	0	1	0
R	0604	26	0	0	0	0	0	0	0	0	0
R	0611	24	1	3	0	0	0	0	0	0	0
R	0611	29	3	1	2	0	0	5	0	0	0
R	0611	30	2	3	0	0	0	8	0	0	0
R	0611	30	0	0	0	0	0	0	0	0	0
R	0611	32	2	1	0	0	0	6	0	0	0
R	0611	25	2	1	4	0	0	2	0	0	0
R	0611	26	13	0	7	0	0	8	0	0	0
R	0611	26	0	0	0	0	0	0	0	0	0
R	0616	24	0	0	7	0	0	0	0	0	0
R	0616	29	0	7	0	0	0	2	0	0	0
R	0616	30	0	5	0	0	0	0	0	0	0
R	0616	32	2	6	0	0	0	0	0	0	0
R	0616	25	0	5	55	0	0	0	0	0	0

Appendix D: (con't)

River	Date (m/d)	Station	Species								
			1	2	3	4	5	6	7	8	9
R	0616	26	0	6	9	0	0	1	0	0	0
R	0616	37	0	4	0	0	0	0	0	0	0
R	0616	26	1	2	7	0	0	0	0	0	0
R	0618	24	0	8	1	0	0	0	0	0	0
R	0618	29	0	30	1	0	0	5	0	0	0
R	0618	30	0	4	0	0	1	1	0	0	0
R	0618	32	0	38	0	0	0	0	0	0	0
R	0618	25	0	22	3	0	0	3	0	0	0
R	0618	26	4	50	2	0	0	4	0	0	0
R	0618	37	0	0	1	0	8	0	0	0	0
R	0618	26	0	0	0	0	0	0	0	0	0
R	0706	24	1	6	0	2	0	0	0	0	0
R	0706	32	0	110	0	0	0	0	0	0	0
R	0706	25	0	6	7	0	0	0	0	0	0
R	0706	26	0	0	0	0	0	0	0	0	0
R	0706	31	1	530	0	0	0	0	0	0	0
R	0721	24	1	1	0	0	0	0	0	0	0
R	0721	29	0	2	0	0	0	0	0	0	0
R	0721	30	0	0	0	0	0	0	0	0	0
R	0721	32	0	1	0	0	0	0	0	0	0
R	0721	25	0	1	0	0	0	0	0	0	0
R	0721	26	0	0	0	0	0	0	0	0	0
R	0805	24	0	0	0	0	0	0	0	0	0
R	0805	29	0	0	0	0	0	0	0	0	0
R	0805	32	0	0	0	0	0	0	0	0	0
R	0805	25	0	0	0	0	0	0	0	0	0
R	0805	31	0	0	0	0	0	0	0	0	0

Appendix E: Physico-chemical data collected during the summer 1997 beach seining surveys in the Kouchibouguac and Richibucto Rivers. "x" denotes values which were not collected during a particular survey.

River	Date (m/d)	Station	S.Sal. (‰)	S.Temp. (°C)
Kouchibouguac	0716	12	3	17
Kouchibouguac	0716	11	5	18
Kouchibouguac	0716	10	8	19
Kouchibouguac	0716	9	8	21
Kouchibouguac	0716	7	10	22
Kouchibouguac	0716	8	10	22
Kouchibouguac	0811	1	25	25
Kouchibouguac	0811	6	5	24
Kouchibouguac	0811	5	9	24
Kouchibouguac	0811	4	15	25
Kouchibouguac	0819	2	27	17
Kouchibouguac	0819	4	25	20
Kouchibouguac	0826	11	3	19.5
Kouchibouguac	0826	10	4	22
Kouchibouguac	0826	9	6	21
Kouchibouguac	0826	7	x	x
Kouchibouguac	0826	5	x	x
Richibucto	0711	21	7	25
Richibucto	0711	25	5	23
Richibucto	0711	32	2	21
Richibucto	0718	25	13	24
Richibucto	0718	26	7	26
Richibucto	0718	28	12	23
Richibucto	0718	27	0	26
Richibucto	0718	29	6	26
Richibucto	0718	30	2	24
Richibucto	0718	31	10	24
Richibucto	0718	32	6	25
Richibucto	0724	25	14	22
Richibucto	0724	26	10	21
Richibucto	0724	28	12	24
Richibucto	0724	27	5	21
Richibucto	0724	29	8	26
Richibucto	0724	30	3	24
Richibucto	0724	31	9	23
Richibucto	0803	25	15	21
Richibucto	0803	26	13	21

Appendix E: (con't)

River	Date (m/d)	Station	S.Sal. (‰)	S.Temp. (°C)
Richibucto	0803	28	18	21
Richibucto	0803	27	5	20
Richibucto	0803	29	10	20
Richibucto	0803	30	3	17
Richibucto	0803	31	10	21
Richibucto	0803	32	5	18
Richibucto	0804	17	23	23
Richibucto	0804	19	20	24
Richibucto	0804	20	11	24
Richibucto	0804	21	21	24
Richibucto	0804	22	8	24
Richibucto	0804	23	13	22
Richibucto	0804	24	15	22
Richibucto	0818	32	4	21
Richibucto	0818	34	0	20
Richibucto	0818	35	1	20
Richibucto	0818	36	5	21
Richibucto	0818	33	7	21
Richibucto	0818	37	0	17
Richibucto	0821	10	4	19
Richibucto	0821	9	4	19
Richibucto	0821	8	8	20
Richibucto	0821	6	18	21
Richibucto	0821	7	24	21
Richibucto	0821	3	25	20
Richibucto	0821	4	25	20
Richibucto	0827	1	27	21
Richibucto	0827	5	26	22
Richibucto	0827	14	26	22
Richibucto	0827	17	23	25
Richibucto	0828	16	22	18.5
Richibucto	0828	19	21	19
Richibucto	0828	20	16	21
Richibucto	0828	23	20	18
Richibucto	0828	24	21	14
Richibucto	0828	25	11	22.5
Richibucto	0828	28	11	21
Richibucto	0828	29	6	23
Richibucto	0828	31	11	22

Appendix E: (con't)

River	Date (m/d)	Station	S.Sal. (‰)	S.Temp. (°C)
Richibucto	0828	32	5	22.5
Richibucto	0828	33	5	23.5

Appendix F: Physico-chemical data collected during the summer 1998 beach seining surveys in the Kouchibouguac and Richibucto Rivers. "x" denotes values which were not collected during a particular survey.

River	Date (m/d)	Station	S.Sal. (‰)	S.Temp. (°C)
Kouchibouguac	0629	14	0	17
Kouchibouguac	0629	4	8	20
Kouchibouguac	0630	1	25	19
Kouchibouguac	0630	4	9	21
Kouchibouguac	0630	5	7	21
Kouchibouguac	0630	6	5	20
Kouchibouguac	0630	7	6	21
Kouchibouguac	0630	8	4	19
Kouchibouguac	0630	9	4	20
Kouchibouguac	0630	10	7	21
Kouchibouguac	0630	11	3	19
Kouchibouguac	0717	4	12	26
Kouchibouguac	0717	5	9	25
Kouchibouguac	0717	6	8	24.5
Kouchibouguac	0717	7	7	24
Kouchibouguac	0717	8	5	23
Kouchibouguac	0717	9	5	23
Kouchibouguac	0717	10	5	22.6
Kouchibouguac	0717	11	4	22
Kouchibouguac	0727	3	28	21.5
Kouchibouguac	0727	4	21	22
Kouchibouguac	0727	5	21	21.5
Kouchibouguac	0727	7	9	21
Kouchibouguac	0727	9	5	22
Kouchibouguac	0727	11	2	20.5
Kouchibouguac	0812	4	24	23
Kouchibouguac	0814	5	4	21
Kouchibouguac	0814	7	1	21
Kouchibouguac	0814	9	0	22
Kouchibouguac	0814	11	0	21
Kouchibouguac	0814	4	25	16
Kouchibouguac	0814	1	25	22
Kouchibouguac	0818	5	15	22
Kouchibouguac	0818	7	11	22
Kouchibouguac	0818	9	18	22
Kouchibouguac	0818	11	3	22
Kouchibouguac	0818	4	20	23

Appendix F: (con't)

River	Date (m/d)	Station	S.Sal. (‰)	S.Temp. (°C)
Kouchibouguac	0818	1	26	22
Kouchibouguac	0821	4	20	20
Kouchibouguac	0821	5	15	20
Kouchibouguac	0821	9	8	20
Kouchibouguac	0821	1	28	17
Kouchibouguac	0823	1	26	18
Kouchibouguac	0823	4	25	22
Kouchibouguac	0826	4	25	18
Kouchibouguac	0826	4	19	19
Kouchibouguac	0826	5	20	19
Kouchibouguac	0826	7	16	19
Kouchibouguac	0826	9	10	18
Kouchibouguac	0909	4	25	16
Kouchibouguac	0909	5	22	16
Richibucto	0625	24	11	21.5
Richibucto	0625	32	1	23
Richibucto	0625	25	10	23
Richibucto	0702	24	6	20
Richibucto	0702	30	0	20
Richibucto	0702	32	2	21
Richibucto	0702	28	2	20
Richibucto	0702	25	7	21
Richibucto	0702	17	8	20
Richibucto	0702	31	4	20
Richibucto	0702	37	0	19
Richibucto	0703	30	5	27
Richibucto	0703	33	4	25
Richibucto	0703	26	5	26
Richibucto	0703	27	5	26
Richibucto	0703	37	0	19
Richibucto	0703	21	14	26
Richibucto	0713	29	4.5	23
Richibucto	0713	30	2	20
Richibucto	0713	32	2	23.4
Richibucto	0713	33	0	22.5
Richibucto	0713	37	0	17.5
Richibucto	0714	24	14	24.7
Richibucto	0714	26	9	24.3
Richibucto	0714	25	12	25.1

Appendix F: (con't)

River	Date (m/d)	Station	S.Sal. (‰)	S.Temp. (°C)
Richibucto	0714	27	21	23.8
Richibucto	0714	17	23	22.8
Richibucto	0730	29	11	22.5
Richibucto	0730	28	15	22.5
Richibucto	0730	32	9	23
Richibucto	0730	33	8	23
Richibucto	0730	37	5	22
Richibucto	0731	23	19	22
Richibucto	0731	20	20	22
Richibucto	0731	26	13	22
Richibucto	0731	24	17	22.5
Richibucto	0731	18	18	23
Richibucto	0731	17	23	21
Richibucto	0810	24	20	27
Richibucto	0810	14	22	27
Richibucto	0810	23	19	26
Richibucto	0810	18	21	26
Richibucto	0810	17	22	26
Richibucto	0810	20	21	26
Richibucto	0813	14	25	19
Richibucto	0813	2	28	15
Richibucto	0813	1	28	15
Richibucto	0813	5	26	17
Richibucto	0813	11	26	17
Richibucto	0813	15	26	17
Richibucto	0813	17	27	18
Richibucto	0819	1	31	21
Richibucto	0819	2	33	20
Richibucto	0820	24	19	22
Richibucto	0820	23	20	23
Richibucto	0820	14	22	23
Richibucto	0820	17	18	22
Richibucto	0820	20	15	22
Richibucto	0825	17	24	19
Richibucto	0825	6	25	19
Richibucto	0825	5	26	19
Richibucto	0825	2	27	18
Richibucto	0825	14	25	19
Richibucto	0827	19	22	20

Appendix F: (con't)

River	Date (m/d)	Station	S.Sal. (‰)	S.Temp. (°C)
Richibucto	0827	18	22	19
Richibucto	0827	15	25	19
Richibucto	0827	13	28	18
Richibucto	0827	12	27	18
Richibucto	0827	6	27	18
Richibucto	0827	14	25	19
Richibucto	1006	24	15	10
Richibucto	1006	32	5	8
Richibucto	1006	33	2	8
Richibucto	1006	28	8	8
Richibucto	1006	25	11	9
Richibucto	1006	20	20	9
Richibucto	1006	23	18	9

Parcs Canada, région de l'Atlantique, produira trois séries de rapports en sciences des écosystèmes afin de communiquer de nouvelles données scientifiques, de consigner des données scientifiques, et de résumer les connaissances existantes ou de formuler des recommandations d'ordre technique. La fonction principale et le public visé détermineront la série dans laquelle un rapport sera publié. Chaque série contiendra des informations scientifiques et techniques qui viendront enrichir les connaissances existantes, mais ne pourraient être publiées dans les revues professionnelles en raison de leur présentation.

- ***Les Rapports techniques en sciences des écosystèmes - Parcs Canada*** favoriseront la diffusion à grande échelle d'information scientifique et technique tirée des études spéciales effectuées par Parcs Canada. La matière traitée et la série reflètent l'intérêt et les politiques de Parcs Canada dans de nombreux aspects des sciences des écosystèmes. La série comprendra des inventaires d'écosystèmes, des inventaires de ressources, des études diverses, des relevées sur des espèces ou des guildes et des concepts innovateurs de gestion.
- ***Les Rapports d'études en matière de sciences des écosystèmes - Parcs Canada*** permetteront la publication de comptes rendus, de bibliographies et d'études d'options en matière de gestion faites par Parcs Canada. Les descriptions et les analyses de ressources sont aussi publiées dans cette série, en entier ou en partie.
- ***Les Rapports de surveillance et de données relatives aux écosystèmes - Parcs Canada*** offriront un moyen de présenter des compilations de données sans analyse détaillée. En général, ce genre de compilation sert à appuyer des publications scientifiques ou des rapports techniques en sciences des écosystèmes. Parcs Canada publiera dans cette série des données brutes qui ne sont pas inclues dans une banque de données nationale et qui méritent l'archivage.

Rapports en sciences des ecosystèmes sont publiés dans la langue officielle choisie par l'auteur en fonction du public visé, avec un résumé dans la deuxième language officielle.

Objectifs
Ces séries de rapports serviront à :

- communiquer les résultats des recherches effectuées en sciences des écosystèmes aux scientifiques et aux gestionnaires, ainsi qu'aux membres du public que les activités enterprises par Parcs Canada en écologie et en conservation intéressent.
- offrir des publications professionnelles, crédibles et précises qui seront soumises à l'évaluation par les pairs.
- favoriser la diffusion de l'information, la créativité, l'efficacité et le travail d'équipe dans les projets de recherche.

Évaluation par les pairs
Le rédacteur nommera deux lecteurs choisis, dans la mesure du possible, parmi le personnel scientifique de Parcs Canada, qui seront chargés de faire une critique de chaque manuscrit. On fera appel à des lecteurs de l'extérieur en raison de l'expertise exigée, du temps disponible et de l'objectivité nécessaire. Les lecteurs renverront le manuscrit au rédacteur en y joignant leurs commentaires par écrit. Le rédacteur renverra le manuscrit à son ou à ses auteurs avec les commentaires des lecteurs. L'auteur prendra connaissance des commentaires et tiendra compte de ceux avec lesquels il est d'accord, puis il retournera le manuscrit révisé au rédacteur en lui expliquant par écrit pourquoi il n'a pas tenu compte de certains commentaires. Le rédacteur enverra ensuite le manuscrit au garde de parc en chef, ou, s'il s'agit d'employés du bureau régional, au superviseur immédiat de l'auteur, pour faire approuver la publication et l'impression du manuscrit. Dans le cas de publications de moindre importance, le rédacteur peut, à sa discrétion, décider de ne pas avoir recours à des lecteurs; lui-même et le superviseur immédiat de l'auteur serviront alors de lecteurs. En cas de désaccord entre l'auteur et le rédacteur au sujet du manuscrit, c'est le gestionnaire ministériel principal qui tranchera.

Directives à l'intention des auteurs
Ces séries de rapports seront consacrées à la publication de travaux effectués dans la région de l'Atlantique en science des écosystèmes et seront mises à la disposition de tous les employés de Parcs Canada, du ministère du Patrimoine canadien, de leurs collaborateurs ou de toute personne qui travaille pour le compte de Patrimoine canadien.

Les auteurs soumettront au rédacteur régional une copie de leur manuscrit sur support en papier, une version sur disquette en WordPerfect Windows ou DOS et le nom de trois lecteurs éventuels qui ne connaissent pas le manuscrit.

Pour de plus amples renseignements, communiquez avec :

Neil Munro
Rédacteur des séries de Rapports
Parcs Canada
Historic Properties
Halifax (Nouvelle-Écosse)
B3J 1S9
(902) 426-2797
FAX 426-2728